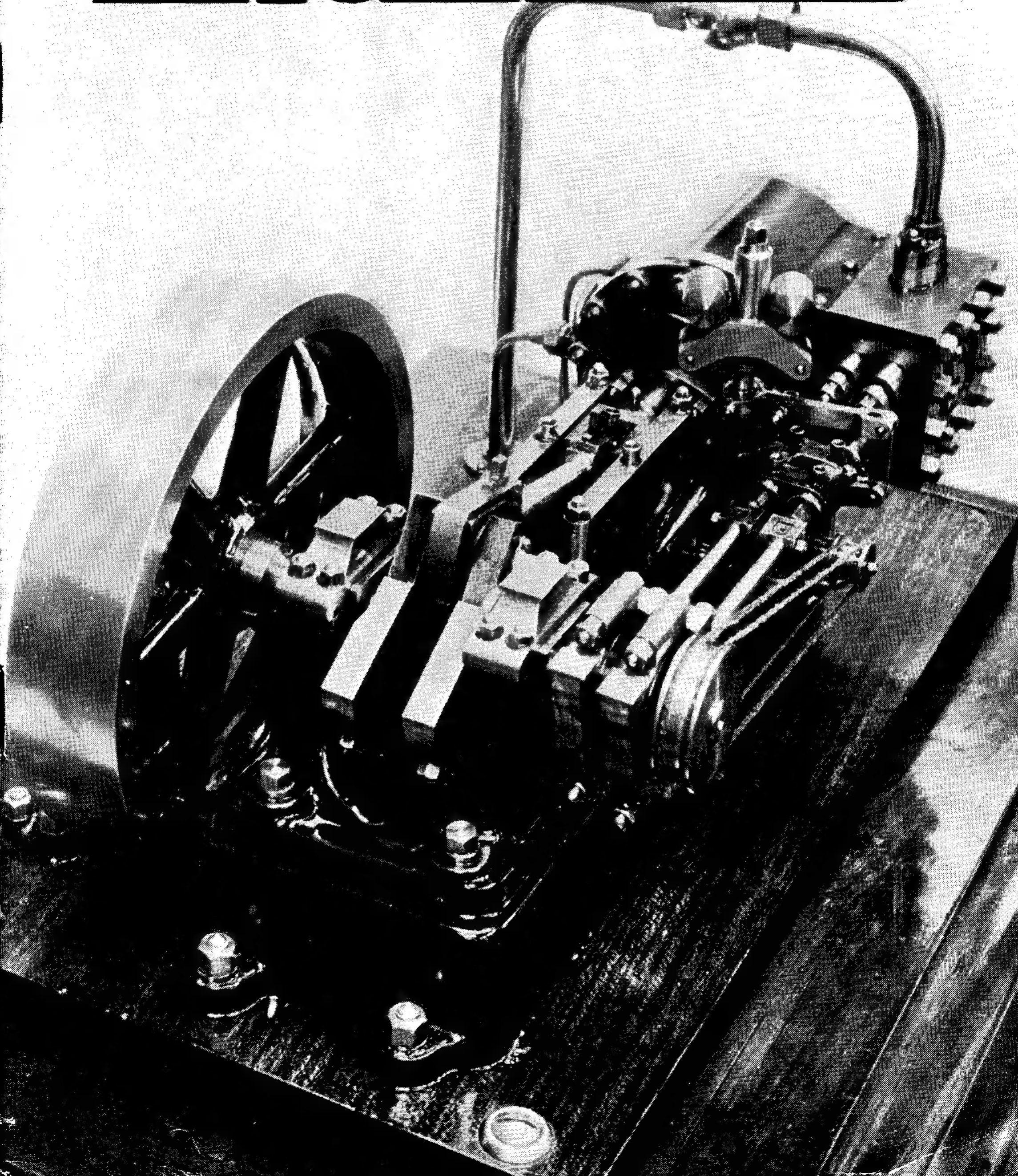
Vol. 105 No. 2635 THURSDAY NOV 22 1951 9d.

THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

22ND NOVEMBER 1951 VOL. 105 NO. 2635

SMOKE RINGS

Our Cover Picture

● THE MODEL horizontal mill engine shown in this photograph was built by Mr. S. T. Harris, and shown working under compressed air on the S.M.E.E. stand at this year's "M.E." Exhibition. It represents an engine of the more modern type, such as built by several well-known makers during the present century in moderate powers for use in industrial plant. A distinctive feature of its design is the governing system, which incorporates an orthodox type of centrifugal governor on a vertical shaft, driven by belting and bevel gears, but instead of controlling a throttle valve as on most of the older mill engines, it controls expansion through linkage operating on a double slide-valve, similar in principle to the Meyer expansion valve-gear. The workmanship and finish of the engine are of a high order, in common with that of several other models built by Mr. Harris, which have qualified for high awards at previous "M.E." Exhibitions.

The "M.E." Speed Boat Competition

● READERS ARE reminded that entries for this year's annual competition are accepted up to December 31st, and awards are given in all classes, for runs made at any time during the year. The boats, to be eligible for entry, must be constructed by the entrant or entrants, including both the hull and engine, though some latitude is allowed for the use of finished or part-finished components, provided that these are specified on the entry form. To save entrants trouble in obtaining witnesses to verify runs, the evidence of any run at a public regatta or otherwise which has been duly recorded by the M.P.B.A. or their authorised representatives will be accepted. Entry forms may be obtained from this office on receipt of a stamped addressed envelope.

The "M.E." Grand Prix Car

● WE TAKE this opportunity to thank our many readers who wrote to express their interest in our recent short series on miniature Grand Prix racing. At the same time, we can announce our forthcoming series on the construction of the "M.E." Grand Prix car, a truly superb model of the 158 Alfa Romeo designed and constructed specially for our readers by that brilliant exponent of the racing car in miniature, Mr. Rex Hays.

This model is correct and complete in every detail and is to 1 in. scale for motors of 1.5 c.c. capacity. The article will be fully illustrated with line drawings and photographs, and the full-scale G.A. outline drawings will be obtainable from our Plans Department from the day the first instalment appears.

Musical Boxes

● WHAT A little paragraph in these columns can lead to is often astonishing. Since our first mention of musical boxes a few weeks ago, we have received dozens of letters and enquiries, and a considerable number of useful hints and tips on "rejuvenation." One reader inserted an advertisement and, to use his own words, "acquired a *very* high-class box" as a result. We have not, however, heard from any reader who has actually made a musical box; could it be that such a hero is hiding his light under a bushel?

Mechanised Track Equipment

● ON OCTOBER 31st and November 1st, British Railways held an exhibition and demonstration of the latest mechanised equipment which is now available for laying and maintaining railway track, and it certainly made a most impressive display. Few people not actually "in the know" can have the remotest idea of the extraordinary variety of automatic and semi-automatic machines that are now available for the use of platelayers and gangers. The list is a long one comprising such useful appliances as: ballast cleaners, scarifiers, tampers, mobile cranes, rail barrows, spike drivers, impact wrenches, relaying machines, creep adjusters, welding equipment, slewing machines, trolleys, generators, hand tools, lighting plant, drills, saws, boring tools, scythes, hoes, hedge trimmers, weed sprayers, portable ramps, truck movers and rammers. All these are power driven, and their purposes are: first, to lighten the heavy manual labour involved in maintenance and renewal; secondly, to compensate for man-power shortages; thirdly, to release manpower for less arduous work which cannot be carried out by machines, and fourthly, to save time on the job and allow traffic to move more freely.

Some of these machines are of Continental origin, but they are being manufactured in Britain. To describe them as being ingenious is to put the matter mildly; many of them are extremely clever. There can be little doubt, however, that they meet the requirements for which they have been designed, and we are glad to have had the opportunity of examining them and seeing them in action.

Model Yacht Racing and Building

● OUR COMMENTS regarding the model yacht depicted on the cover of our issue for October 25th have brought a letter from Mr. F. Shackleton, hon. publicity officer, Model Yachting Association, who writes:—

"The model in question is worthy of praise, being the completed idea of an enthusiast, in practical form. Your comparison with racing yachts, however, should not be in question. The designing and building of model racing craft bear no relation to the copying of a prototype.

"Much pleasure could and would be had by the owner sailing the prototype. The sailing of a racing model yacht, however, calls for much knowledge in sail setting and design, besides an interest in or knowledge of hull design. The knowledge acquired in model yacht racing would be a valuable asset to anyone taking up large craft sailing, besides the knowledge of building which is acquired by most enthusiasts in this sport.

"The storage under lock and key, which you mention, combines with it a convenience of having one or more craft easily adjacent to the sailing venue. The size of these yachts varies in length from 3 ft. to nearly 7 ft., according to class, and the sport is one which can be enjoyed by young and old."

We were pleased to receive this letter, but we sincerely hope that Mr. Shackleton and everyone interested in model yacht racing will not think that we had any intention of belittling the model racing yacht, as compared with the model of a prototype. We realise that the sailing of a model racing yacht calls for expert knowledge of a very high order, and that this knowledge can be and has been of great value to the designer of the full-size craft.

The reference to model yachts being kept under lock and key was made to appear stronger than we intended, due to the omission of the words "most of" before the words "their time being spent," and the omission escaped our notice when checking the proofs.

The racing yacht and the people who race them have our profound respect and admiration; but there are many people who miss the real pleasure of sailing a boat because they feel that they cannot compete with the experts. If the building of "prototype" models encourages such people, then there is something in it which benefits all who are interested in the hobby.

Obviously a Model Engineer

● MR. E. M. ACKERY, of Sydenham, has sent us the following extract from *The Architect and Building News*, under the heading "Hobbies Corner":

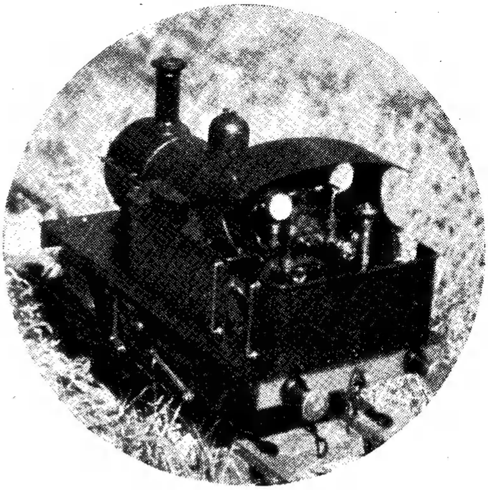
"A Yorkshireman has just completed a model bicycle with wheels about the size of a threepenny bit. The bicycle has 292 parts and all are made of gold. I wonder how the maker arrived at his choice of subject and material. Had he a store of sovereigns lying fallow which had to be used for something? Or did he badly want a golden bicycle to ride, but, being of limited means, could only afford sufficient gold for a token of his ambition? Whatever the reason for so prodigal display of patience, he will join the makers of battleships from matchsticks, sculptors in ice or butter, snail watches and smoke grinders who, if the Lion and Unicorn Pavilion is to be believed, contribute so essentially to the British character."

We have serious doubts as to the accuracy of judgment displayed by the writer of that paragraph! We think we can do no more than quote the final sentences of Mr. Ackery's letter: "Forward to battle, Mr. Editor! He is a model engineer, this Yorkshireman, and must not be classed with the cranks of, or in, the South Bank Exhibition."

That last sentence may seem a little blunt; but, unless we are mistaken, so is the Yorkshireman referred to, if he is typical of the kind we know! In any event, we agree whole-heartedly with Mr. Ackery's comment.

"L.B.S.C.'s" Lobby Chat

Senorita "Tich"

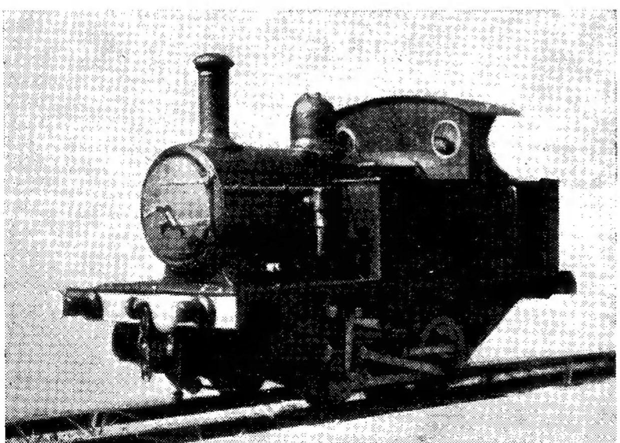


Seen from the bridge

READERS who regularly follow these notes will recollect that some time ago, I received a pergamino—what British folk would call an illuminated address—from a group of locomotive builders in Buenos Aires, Argentina. A photograph of this unique "testimonial" was reproduced in the "Smoke Rings" columns; the original now hangs alongside the clock, in the upstairs room which I use for a writing, drawing and correspondence office, and I'm proud to have it. Since receiving it, I have been in communication with some of the signatories, and they promised to let me have photographs of their engines. The first of these have now arrived, and are shown here. This edition of *Tich*, with the larger boiler, was built by Dr. Raul A. Negrete, and a jolly good job he has made of the little "senorita." At the time the photographs were taken, the engine was not quite completed; she still needed cab steps and one or two other oddments, and had only a first rough coat of paint. However, the pictures show the quality of the workmanship put into the wee engine; the footplate fittings, for example, are better by far than those on many locomotives which have been shown at exhibitions. There is no need to describe the engine, as she is built in accordance with the instructions given in these notes. The only trouble experienced, was through leaky clacks and valves, caused by using steel balls that were supposed to be rustless, but were very much not so; however, that has now been remedied. Dr. Negrete says that the boiler is a wonderful steamer; he has to open the firehole door every couple of minutes or so, to prevent too much blowing-off.

The Track

Our worthy friend's line is a straight one, nearly 100 ft. long, and composed of $\frac{3}{8}$ in. square iron screwed direct to the sleepers; not exactly an ideal road for such a small engine to show its paces. However, it does the job all right, and affords the builder and his friends much pleasure; he says that they all think kindly of your humble servant when they run their engines, for which I bow gratefully. *Tich* is not Dr. Negrete's only engine; he has also a nearly-completed *Doris*, and is very enthusiastic about the steaming capabilities of her boiler, saying that it maintains 100 lb. pressure with ease, despite the fact that, at present, his pistons and valves are not all they might be, and are probably wasting steam. He intends to fit new cylinders altogether, as soon as castings are available, and has promised to forward some pictures of that engine as well.

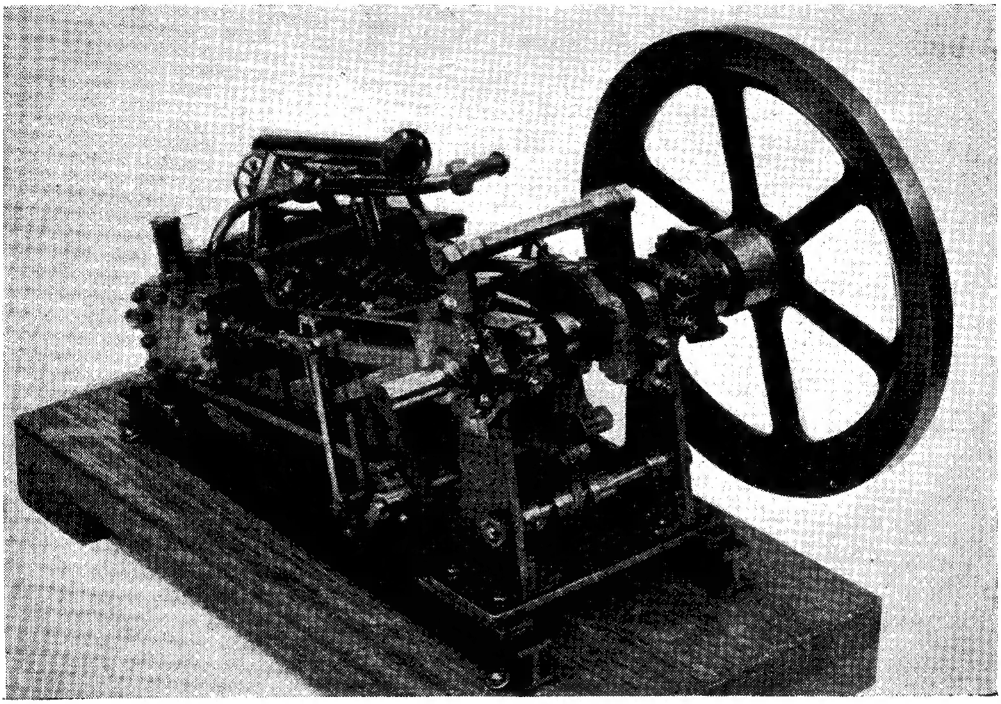


Senorita "Tich"

Passing Thoughts

In offering hearty congratulations to our South American friend on his excellent work, the thoughts pass through my mind that he, and his fellow-countrymen who build little locomotives from my notes, work under a great disadvantage, when compared with builders in this country and other parts of the British Commonwealth and U.S.A. The notes are in, what is to them, a foreign language; our locomotive terms are very different; our measurements are in inches instead of millimetres; my notes are written

in—well, not exactly the " third programme " style, shall we say, but much more like the lingo of the drivers' lobby, minus the Bernard Shaw adjectives ; and on top of it all, there is the trouble of importing supplies. With these drawbacks, it is something akin to a feat, to build an engine like *Tich*, and make a perfect success of it, and it makes some " home " efforts seem very small potatoes in comparison. So all honour to our friends, not only in South America, but in other parts of the world where little locomotives are successfully completed under the same conditions.



Locomotive works go " paddling "

Oh, What a Surprise !

Before leaving the subject of *Tich* I can't resist mentioning an incident which recently occurred in the island whose " trade-mark " consists of three legs—not the Betty Grable variety, I hasten to add ! Mr. A. H. Mullen, who lives at Laxey, and has been in charge of the Snaefell Mountain Railway (a Milly Amp line) for the past six years or so, read my specification for *Tich*, and said to himself " Never in this world will a steam locomotive of that size haul a man." He then thought that the best way to prove it, was to build one. He is interested in locomotives, and is a persevering sort of worker, too ; for example, he built his own lathe, a job which took three years. He had already made a start on *Doris* ; incidentally, it is strange that many builders have selected these two particular engines—*Doris* and *Tich* must belong to the same family ! Anyway, our Laxey friend put *Doris* aside for the time being, started in on *Tich*, and completed her in a year, all ready for the big showdown.

Being a friend of Mr. Cecil Wilkinson, of Douglas, he took *Tich* along to Mr. Wilkinson's line for the trial run. Mr. Wilkinson's own engine, a $3\frac{1}{2}$-in. gauge Isle of Man type 2-4-0 tank, which I nicknamed *Manx Cat* because she has no tail, or to be more exact, no tender, has already been described and illustrated in these notes. When Mr. Wilkinson examined *Tich* he said " Well, she's a bit stiff, and in that state I shouldn't expect her to haul a live load right away ; but don't be downhearted if she fails on the first trial." They got up steam, and then *it happened* ! To the great amazement of the two friends, little *Tich* just walked off with her thirteen-stone owner, at the first time of asking ; to use his own words " She just steamed and pulled like a little witch." Naturally, he was delighted, and says that once more I was perfectly right, and he will graciously put another feather in my hat—a statement that will tickle (though not literally !) my few personal friends.

Mr. Wilkinson's own engine is pretty hot stuff, but as *Tich* is only about half her size, his astonishment is easily accounted for. *Tich's* builder says that he is now going right ahead with *Doris* with full confidence, and wondering what on earth she will be able to manage when completed. As for your humble servant, may I repeat that I always underestimate, because of the great kick it gives to our locomotive-building friends when their efforts " do better," especially when

it is their first engine. But there is just one point about that " feather," viz. instructions are useless without common sense, patience, and perseverance to carry them out. *It was the way Mr. McMullen interpreted and carried out the instructions, that made his engine a successful job*; nuff sed!

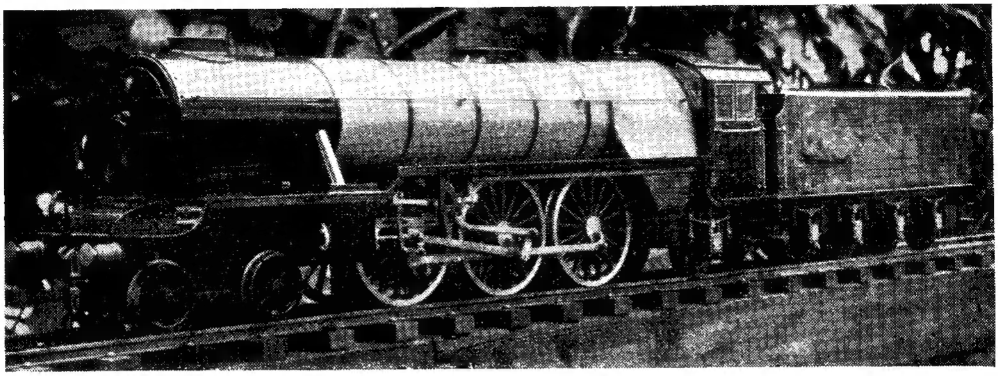
Another Use for Locomotive Components

Correspondents often ask how to use locomotive parts which have been described in these notes, on other types of engines, such as traction, stationary and marine; so they should be interested in the reproduced photograph of a marine engine incorporating many " live steam " components. It is the handiwork of an Oxford reader, Dr. A. Livingston, who has also built a *Rainhill*. The marine engine is intended for a paddle steamer; and the flywheel was added temporarily, to enable the engine to tick over slowly, under air pressure, at a local exhibition, at which it was awarded a well-deserved prize. The cylinders and motion were adapted from *Jenny Lind*, an ancient type of single-wheeler for 3½-in. gauge which I described some years ago in a contemporary journal. The full-sized engines were smart in appearance, and among the most speedy and efficient of their time, about the middle of the last century; the L.B. & S.C.R. had a few of them. Blueprints of my 3½-in. gauge version are still available, if any lover of old-timers cared to build one.

Real Hard Work!

Mention was made above of locomotive builders working under great disadvantages, yet bringing their efforts to a successful conclusion. Here is another example. The reproduced photographs show yet another *Lassie*, built in Durban, South Africa, by Mr. R. Millar, in which no castings were used at all. The wheels are made from solid steel plate, all the spokes being cut by hand. The cylinders are made from solid blocks of cast-iron. Home readers who complain bitterly because they occasionally get a casting which is hard, or a little rougher than usual, and needs extra care in machining, don't know when they are well off! It reminds me of the people who were shipwrecked on an uninhabited island. Cases of ships' stores were washed up, which contained enough canned food to last for years; all kinds of luscious fruit grew in profusion, and only needed picking. Yet they moaned unto High Heaven because there wasn't a drop of sauce to put on the cold meat!

Detailed description of the locomotive is unnecessary, as she is built exactly to the specification set out in these notes. Working leaf springs are fitted. The only thing that Mr. Millar had trouble with, was the injector cones, for the simple reason that drills of the correct size for the cone throats were unobtainable in Durban, and he had to make his own. They didn't come up to commercial standards, and the cones came out oversize; but our worthy friend is expecting delivery of some proper drills, so by the time these notes appear, the last item may be successfully completed.



The Durban " Lassie "

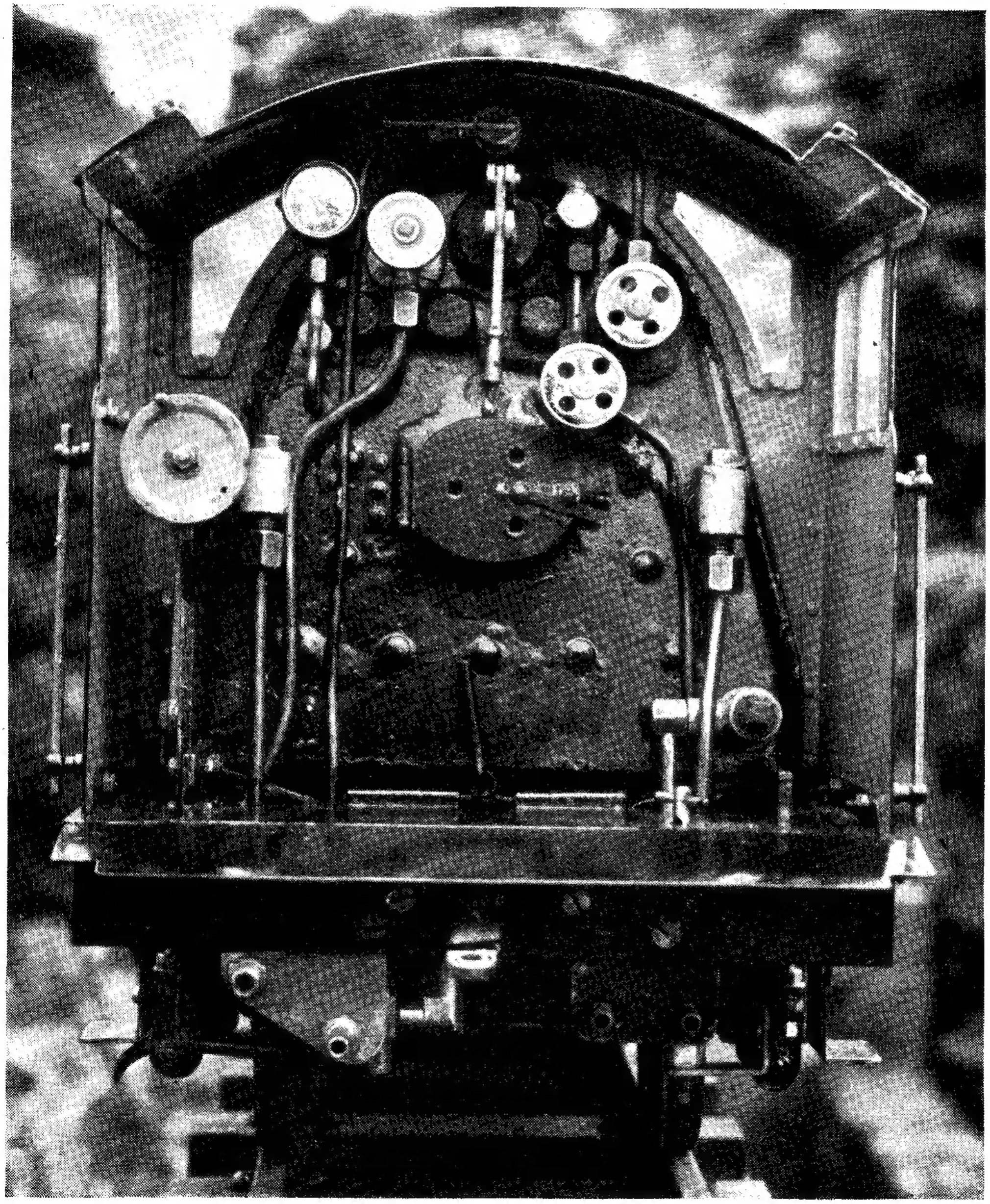
The performance of the engine is well up to expectation. For example, at the Royal Agricultural show at Pietermaritzburg, Natal, the Durban S.M.E. had in operation a line 130 ft. long, on which the *Lassie*, and *Princess Marina*, another engine built to my designs by Mr. G. Fisher, hauled loads of kiddies for five days. The small picture shows the line in operation. The *Lassie* is at work on the afternoon shift. The engine in front is *Princess Marina*, which had already completed her two-hour morning shift, and was run up for the purpose of taking the photograph. Mr. Fisher, her builder, is kneeling beside her. The other party in a white coat, standing and holding his hat, is the worthy builder of the *Lassie*. During the five days the show was on, the two engines handled over 1,500 children without any trouble.

Mr. Millar concluded his cheery letter by saying that he, like your humble servant, is well along the Great Railroad of Life, but he finds that locomotive-building seems to keep him young. I agree wholeheartedly, and know from my correspondence that others find it the same. Concentration on the job in the workshop, and the never-failing pleasure of running the little engines on the road, are wonderful tonics to counter the trials and tribulations of life in the world of today. In addition to our Peter Pan hearts, we have the satisfaction of knowing that

our little railways won't be nationalised, electrified, dieselised, or what-have-you—and we can build and operate any type of engine we darned well like—and that's that!

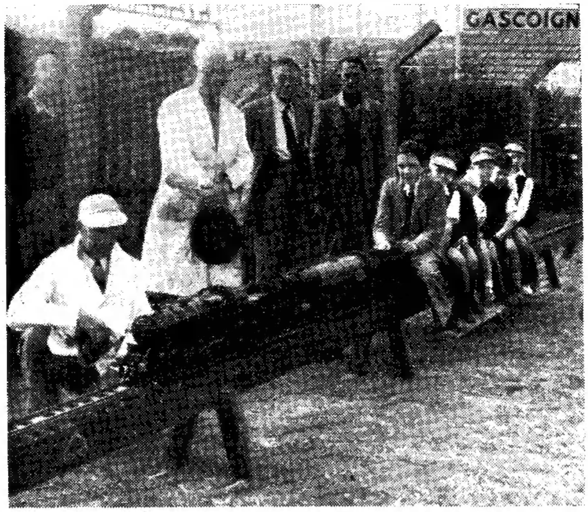
Trouble in the Boiler Shop

One of our beginner readers is in the very dickens of a stew. He developed a yearning for a locomotive, and was in a bit of a dilemma; couldn't afford to buy a finished one, and didn't want to wait until he could build one from scratch, so he struck what he thought was the happy medium, by purchasing the bits of a partly-completed engine. The price was pretty reason-



Cab view of the Durban "Lassie"

able, the goods appeared satisfactory, and everything in the garden was apparently lovely. The chassis was duly completed, and worked fairly well on air test, so he put on the boiler—supposed to be finished by the original builder—connected up, and tried to raise steam ; but alas ! Welsh vegetables promptly started growing between the boiler barrel and firebox wrapper. The barrel is made from tube, and the wrapper from sheet metal, with a piston-ring joint, riveted and brazed. Our friend took the boiler off, and attempted to silver-solder the leaks ; but the trouble he is experiencing is, that as fast as he stops the cracks in one side, a fresh lot appears on the other, and he is about tired of the game.



At Pietermaritzburg, South Africa

This trouble is one that is quite common among inexperienced coppersmiths ; I have come to the aid of two or three personal friends whose boilers developed the same fault. The cause is unequal expansion and contraction. When heating up one side only, the unequal expansion caused by the local application of heat, causes the brazing material on the opposite side to crack, and when the boiler cools again, the crack just opens. The only cure is to treat the whole joint as it was treated—or *should* have been treated—when the boiler was made in the first place.

The Cure

First of all, our friend should file a V-groove right around the barrel, at the point where it joins the wrapper ; this groove should go right down to the "piston-ring." Give the joint a good dose of flux, and lay it in the coke in the brazing pan. Now get the blowlamp or blowpipe going good and strong, and carefully heat up the whole of the boiler, moving the flame about steadily, so that there is no risk of any local overheating. When the flux begins to fuse, the boiler should be hot enough for the repairing operation. Use a good grade of silver-solder, and proceed exactly as if you were building a new boiler ; start by concentration of the flame on one part of the joint (the one nearest bottom of boiler) run in a little silver-solder, then shift the flame of the lamp along a little, run in more silver-solder, and so on, until you have worked your way right around. The boiler can be turned over when about halfway along the joint. When the whole joint has been completed, leave it in the coke to cool slowly ; don't pickle it right away, but see that the silver-solder has well and truly set, before putting the boiler in the pickle bath. If the cooling-off has been evenly done, the joint will be perfect. Smooth off any superfluous knobs and excrescences with a file.

When actually on the job, the great thing to watch is to keep the joint as evenly heated as possible, letting each application of the silver-solder overlap the previous one. Fill the groove right up. That, and the even cooling, will do the trick. The blowlamp or blowpipe should, of course, be powerful enough to supply sufficient "therms" for the job, a small one being quite useless.

Stopping the Leaks

If a big lamp isn't available, there is a simple way of stopping the leaks, which would make a permanent job, provided they are not too bad. Thoroughly clean the metal for about ½ in. width, all around the joint, and apply a strip of thin copper, about ¼ in. wide, to it, as if you were fitting a boiler band. Give it a dose of soldering fluid, and sweat some solder in, the whole way around, using a blowlamp ; a small one would suffice for that. If the solder sweats in to the full width of the band, for the full circumference of the joint, it will effectually prevent further leakage. Trim off all superfluous solder at each side of the band, with a scraper made from an old file ; and when the boiler is painted, the repair is not noticeable.

Turncock Ahoy !

Most readers have heard of Paddy O'Shillelagh whose cistern pipe burst, up in the loft, and the house was flooded because he forgot to turn off the main stopcock. Well, I've just heard of a parallel case, in connection with one of our beginner locomotive builders. He made a good job of the engine, and fitted an injector, being exceedingly careful to get the cone throats, tapers and spacing O.K. On trying it, he found that all the water ran out of the overflow instead of going into the boiler, so wrote to me and complained about it. I asked what happened when he partly closed the water valve ; did steam come from the overflow ? His reply was "I never touched the water valve—does it need regulating ?" Well, well—after all the instructions I've given about operating injectors ! By noting the no-dribble position of water valves, I can work injectors in the dark.

A Precision Drill

by D. J. Mather

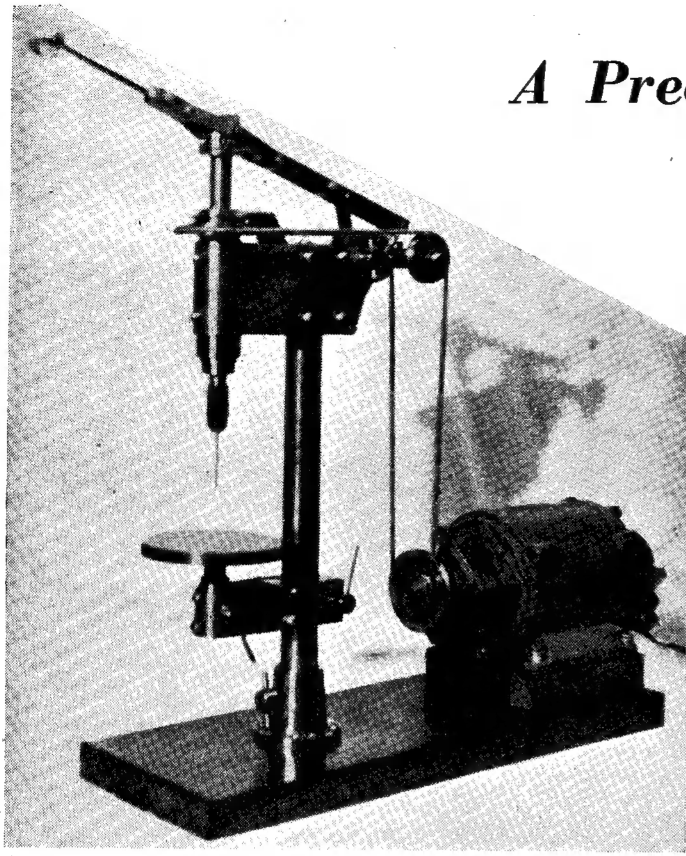


Photo by] [*F. J. W. Smart*

IF one is in the habit of using drills in the Nos. 50-80 range, the need for a precision drill very soon becomes apparent, and the following description is of one designed with several points in mind :

(1) Accuracy.

(2) Ease of construction, no castings to be used, and materials must be readily available. Not too much time to be devoted to this particular project.

(3) Cost to be kept as low as possible and so it was decided to use an Eclipse pin chuck with three interchangeable collets for holding the drills. In use this has been found to be extremely satisfactory in every way. Not only are the drills gripped accurately and firmly, but the depth of the chuck is such that only the end of the drill need protrude, which is especially useful when starting very small holes.

(4) As the range of the drill is from 0-3/32 in., a reasonably light construction was deemed to be sufficient.

(5) The use of bronze bearings in a machine of this kind may be open to criticism, but it was considered that as the drill would not be used to anything like the extent of a normal bench-drill, they would give long service and their renewal would not call for a great amount of work.

(6) The feed arrangement to be *via* the spindle rather than the work table. This is mainly a matter of personal taste, but it was felt that as most of the work to be drilled would be held by hand rather than clamped to the table, a more sensitive feed would be obtained. In practice it was found that it was not satisfactory to use springs sufficiently powerful to return the spindle to its normal position, and so lighter springs were used which balanced the spindle in any position of its travel. This arrangement gives a very sensitive "feel" to the tool, and as the spindle may be returned with just a flick of the finger it seems to offer no disadvantages.

In Fig. 1, which shows the general arrangement of the drill, the springs are omitted for the sake of clarity, but they may be seen in the photograph. Power is obtained from and ex-R.A.F. type 57 rotary converter having a speed of approximately 7,000 r.p.m.

The Column

A piece of mild-steel bar, preferably ground stock, $\frac{7}{8}$ in. diameter × 11 in. long is needed for the column, and a piece of silver-steel $\frac{1}{2}$ in. diameter for the spindle. These should be obtained before construction starts, as they are needed for the accurate assembly of the parts, and the column may be used to check the boring of the holes in the headstock and knee. If a 13 in. length of silver-steel is available do not cut it until the parts are assembled.

Part *A* (Fig. 2) is a piece of mild-steel, $1\frac{1}{4}$ in. square × 2 in. long. This is chucked in the 4-jaw and bored to fit the column. The two B.S.F. holes for the retaining grub-screws are drilled and tapped, but nothing further is done to it at this stage.

The spindle bearing column part *B* is a $2\frac{1}{2}$ in. length of 1 in. diameter B.M.S. bored $\frac{5}{8}$ in. Next, prepare the headstock sides in the flat. For this approximately 12 in. of 2 in. ×

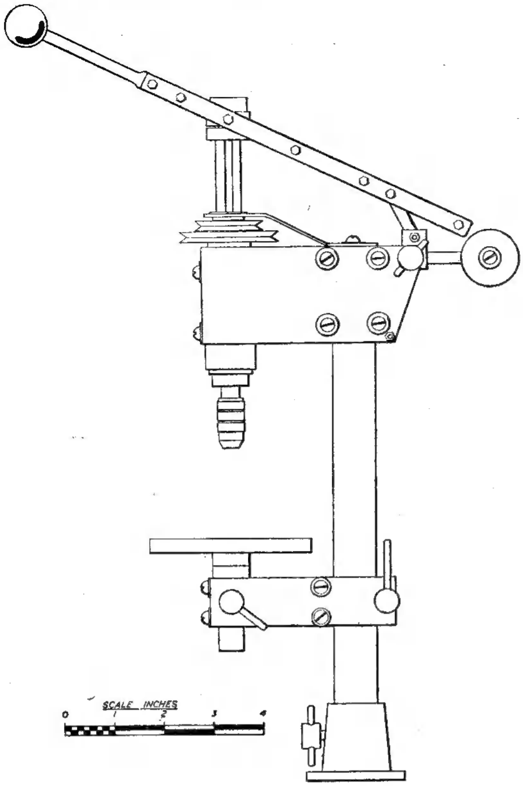


Fig. 1. *General arrangement*

$\frac{1}{16}$ in. mild-steel plate is required. At 6 in. from one end scribe a line square to one edge across the width and on this mark out the positions for the two 5/32 in. Whitworth screws. At the same time, and using the same settings on the surface gauge or other means of marking, mark off similar positions on part *B*. The squareness of the marking on part *B* can be maintained by using a key-seat rule to scribe a line down its length. As the tapped holes and clearance holes must be drilled separately, care must be taken to ensure accuracy of marking out. part *B* may next be fixed to the plate by means of the two screws and washers. The screws should not protrude into the bore. Check that part *B* lies square across the plate. If not, adjustment must be made to one clearance hole.

Bending

Bending to shape is achieved by gripping a length of $\frac{5}{8}$ in. diameter rod vertically in the vice and slipping the drilled hole in part *B* over it, place the fingers of both hands towards the centre of the work and press both sides backwards with the palms of the hands, so that the mild-steel plate embraces the spindle bearing column. Continue bending until the two sides are about $1\frac{3}{4}$ in. apart.

The phosphor-bronze bearings should next be made and fitted.

The parts for the knee (Fig. 3) should next be made in a similar manner, the clamping-screw for the column being completed and fitted. The sheet metal for the sides of the knee should have a slot cut in one side sufficiently deep for the clamping-screw to slide into, so that when the knee is assembled the head of the clamping-screw bears upon the plate, the slot just clearing the screw itself.

Assembly

The headstock and knee may now be assembled. Slip part *A* and *C* on to the column and fix them about 6 in. apart by means of the grub-screws and clamping screw. Place one lining-up above part *A* and one below part *C*. The sides are held in place by means of the $\frac{1}{2}$ in. diameter silver-steel. Place a toolmaker's clamp across the lining-up plate and sides of the headstock, and another across the knee and the other lining-up plate. Now the whole assembly should be quite rigid and perfectly in line. Mark the positions of the retaining screws and drill through to about $\frac{1}{2}$ in. depth with No. 31 drill. When all holes have been drilled the parts are disassembled, the holes in the plates enlarged to 5/32 in. clearance (No. 21 drill) and the remaining holes tapped. The parts are then permanently reassembled. Check that everything is still lined up correctly by putting the silver-steel rod through the spindle bearing and work-table bearing. The final shape of the headstock and the remaining holes, etc., may now be completed, but care must be taken with any subsequent operations not to damage the

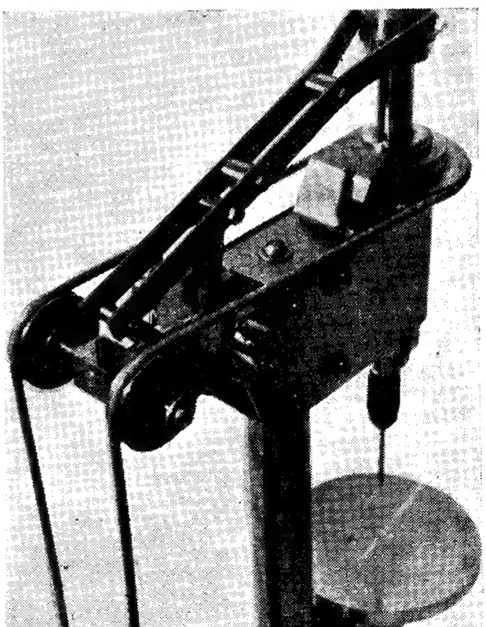


Photo by] [*F. J. W. Smart*

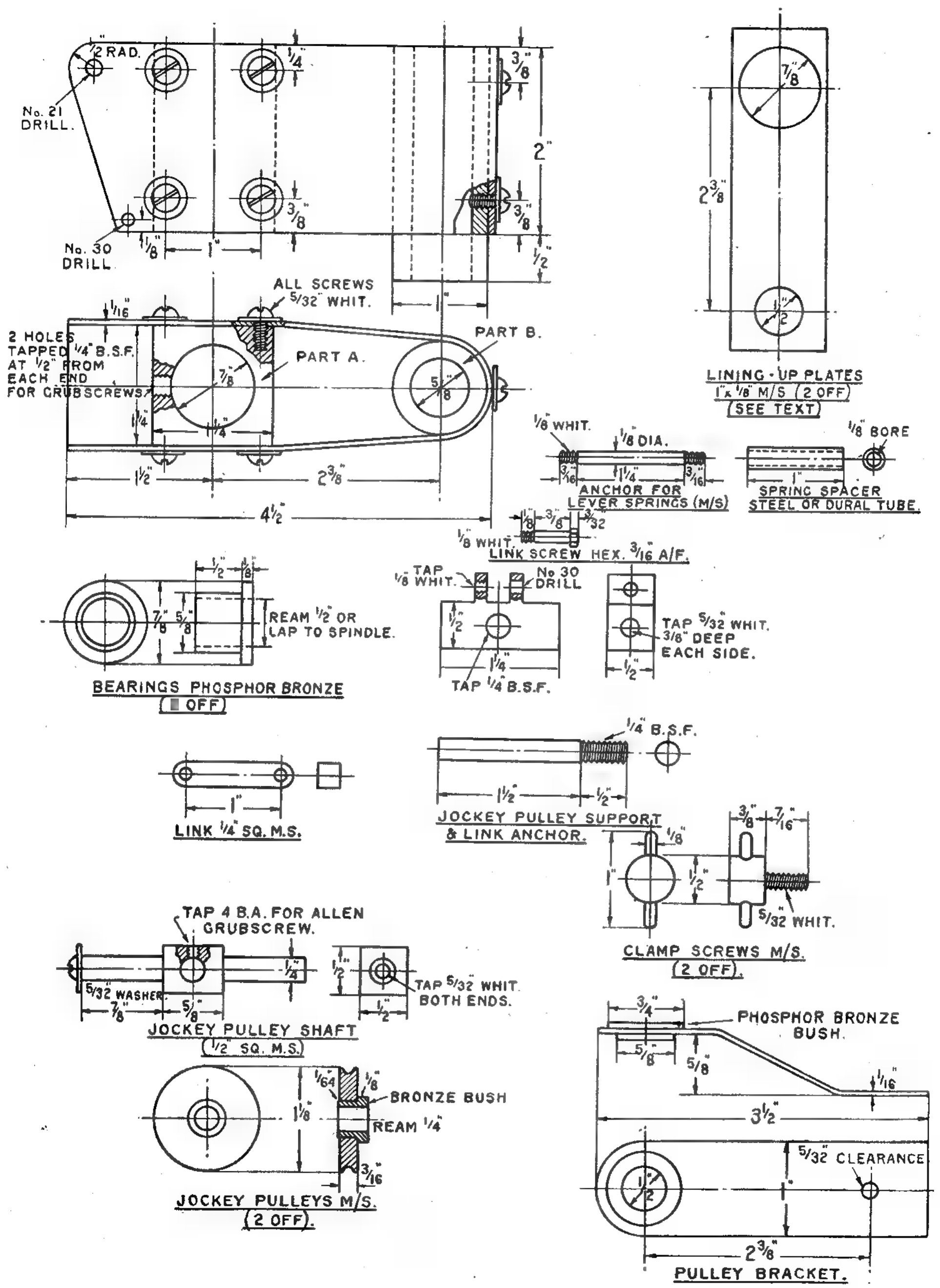


Fig. 2. Headstock details

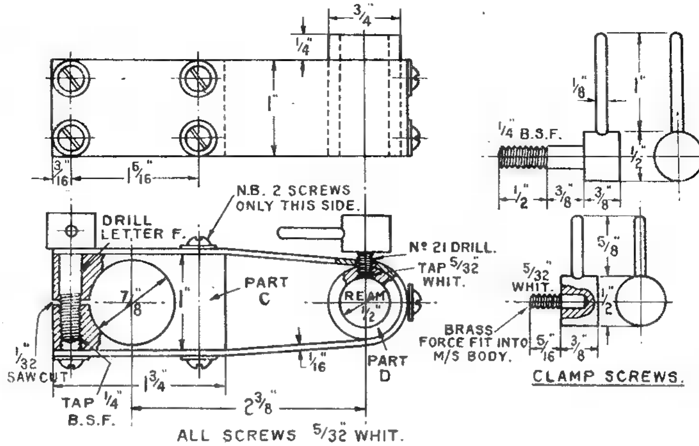


Fig. 3. Details of the knee

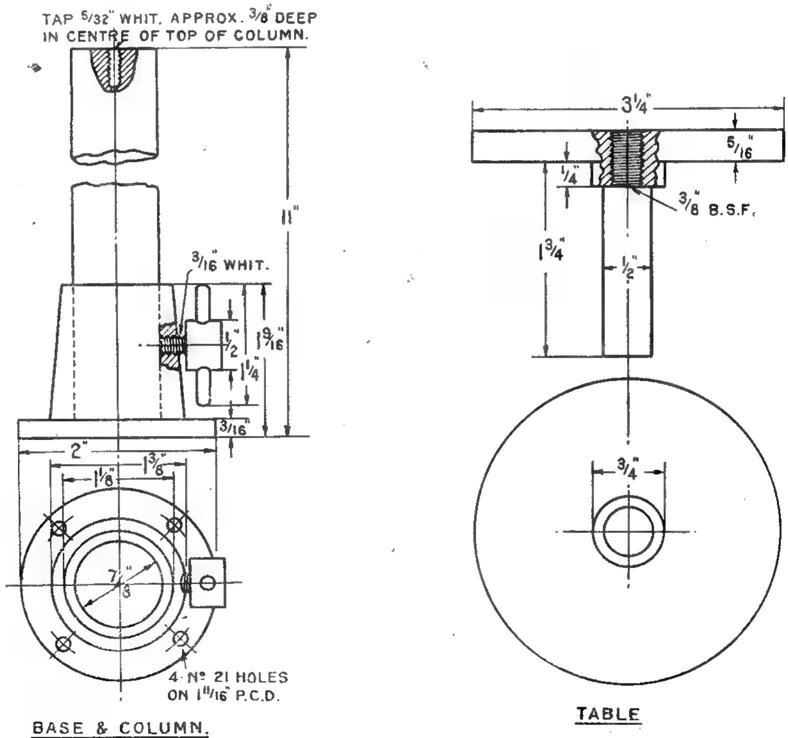


Fig. 4

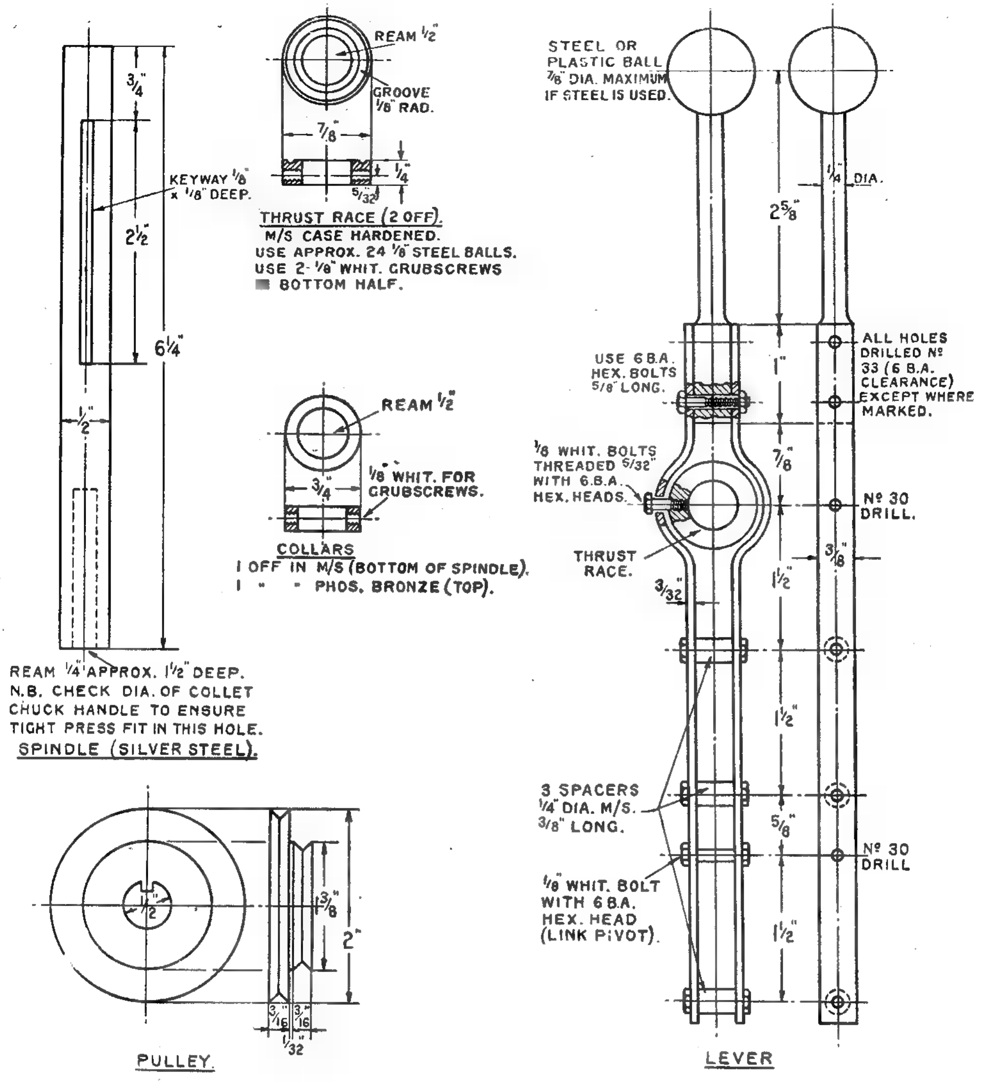


Fig. 5

work or throw it out of alignment by careless clamping in the vice. In practice, it has been found that the headstock and knee are surprisingly robust and do not show any signs of distortion under working conditions.

The remainder of the work is straightforward and calls for little comment. The assembly of the jockey pulleys and link bracket is made clear in the second photograph.

The pulley bracket (Fig. 2) is fixed to the top of the column by means of a 5/32-in. Whitworth screw and its sole function is to prevent the pulley riding up the spindle. There should be no tendency for the bronze-bearing to bind on the spindle.

The bottom of the spindle is bored to a tight push-fit to the handle of the Eclipse chuck. In the writer's case the handle was found to be 0.254 in., so the hole was reamed ¼ in. It was then necessary to polish the chuck handle with fine emery cloth in order to obtain the desired fit. Needless to say, the spindle should be truly centred in the 4-jaw chuck for this drilling operation.

A Photographic Lamp

by A. Smith

HAVING recently obtained a second-hand $\frac{1}{4}$-plate camera with which to take table-top photographs of the various productions of the workshop, some method of supporting and adjusting the 100 W. lamp, which forms the main light source, was considered necessary. The lamp-stand illustrated was therefore evolved.

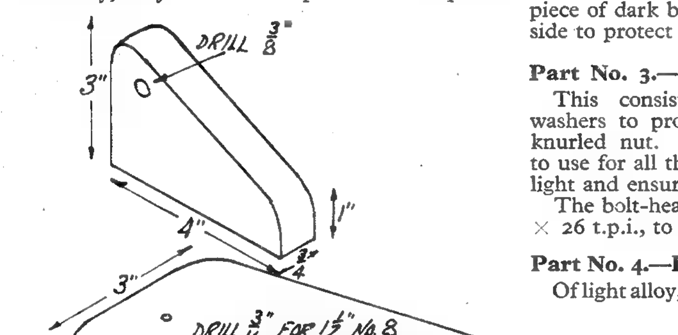
Part No. 1.—The Base

Red beech of $\frac{3}{4}$ in. thickness was employed for this. The shape was set out, pennies and half-pennies being employed for speedily marking the rounded corners. Cutting out was accomplished with a home-made bowsaw, final cleaning-up being done with smoothing plane, spokeshave, and fine cabinet file.

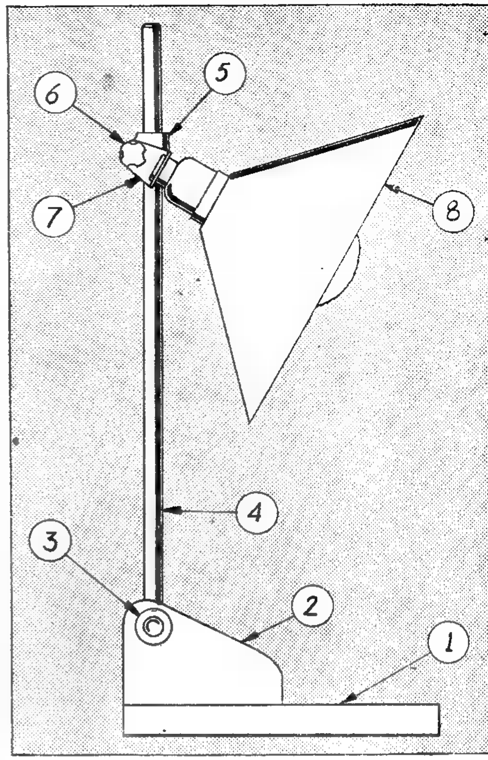
Part No. 2.—Bracket

This was cut from an odd piece of the beech, similar methods of marking out and cutting being employed.

In both these pieces a clean, modern appearance was achieved by maintaining sharp lines, the sharp arris only being removed with fine glass-paper. After assembling to see that they fitted accurately, they were taken apart and each piece



highly polished, using a home-made wax polish prepared by dissolving beeswax in pure turpentine (*oleum terebinthe*). After final assembly, a



piece of dark brown felt was glued to the underside to protect the table-top.

Part No. 3.—Pillar Support

This consists of a large-headed bolt, two washers to protect the wooden bracket, and a knurled nut. Light alloy is an ideal material to use for all the metal parts of this stand, being light and ensuring freedom from tarnish.

The bolt-head is cross-drilled and tapped $\frac{3}{8}$ in. $\times$ 26 t.p.i., to receive the pillar.

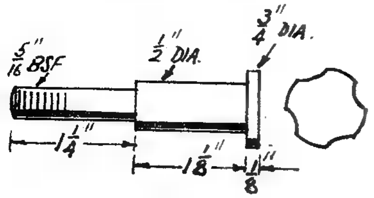
Part No. 4.—Pillar

Of light alloy, the lower end is threaded $\frac{3}{8}$ in. $\times$ 26 t.p.i., fitted to its support, and contoured to suit. The top may have a simple finial turned for the sake of appearance. A reasonable height is 15 in., although it may be higher or lower to suit the individual.

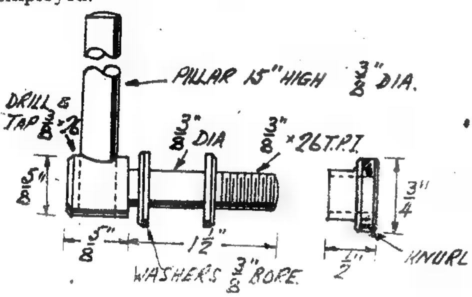
Parts No. 5, 6, and 7.—Lamp and Shade Support

The casting employed for the two-way bracket was found in the scrap box, but a similar component could easily be cut from the solid or fabricated by silvers-soldering two pieces of brass rod at right-angles to each other. Slitting may be done by hand or with a slitting saw in the lathe.

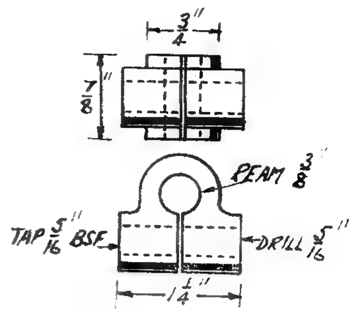
The lampholder bracket is bent up from a scrap of hard rolled brass or light alloy sheet $\frac{1}{16}$ in. thick. Its dimensions may vary from those



given, depending on the type of lampholder employed.



The screw is a simple turning job, an alternative type of head is shown for those who do not possess a knurling tool. The long neck is necessary to bring the head beyond the bracket.



Part No. 8.—The Shade

A cheap celluloid type, obtainable from chain stores, has been found suitable.

Although primarily intended for photographic work, the lamp has been found so useful that it is in constant use in the workshop to light those awkward dark corners so often encountered when operating the lathe or at the assembly bench.

"M.E." Exhibition Flash Back

by Observer

SPEAKING from first-hand experience as technical director of the first wireless exhibition held at the Central Hall, Westminster, the writer made the acquaintance of Major Raymond Phillips, who was exhibiting his wireless-controlled dirigible as one of the attractions. These memories were awakened by the airship at the 1951 "M.E." show.

His airship made a great sensation at the leading music halls, and rightly so. Under appropriate signals, the ship turned from port to starboard, described circles and ascended and descended with the greatest regularity, and dropped "bombs" with accuracy.

His shows went from strength to strength until . . . some Sherlock Holmes in the shape of an L.C.C. inspector, made the awful discovery that the balloon was filled with *inflammable hydrogen gas*! That put the lid on it good and proper, but, undaunted, the inventor inflated his gas bag with air and slung it from the roof so that its movements were easily controlled by radio impulses.

About 1910 the "M.E." published an article on a wireless transmitter, of the Hertz, spark, type, the receiver being a coherer in conjunction with a relay which, operating through a local circuit, rapped out signals, rang bells at a distance and, best of all, exploded charges, of *black* powder, the effect being replete with noise, light and smell!

Being at the time in South Africa, the writer had to send 6,000 miles for his materials, including two miles of wire wound by hand on the table of an old sewing machine in the corner of a bed-sitting room, on the secondary coil of the transmitter.

This apparatus, fixed to a camera tripod, worked without a hitch, and served a useful purpose in a series of lectures on electric waves.

Harking back to Major Raymond Phillips's airship and remote control apparatus, the writer had the great good fortune to meet Sir Oliver Lodge and to cement a friendship which lasted until the great scientist's death. Dr. Lodge told the writer that he named the, then, only practical detector a "coherer," as the particles of nickel, being of a magnetic nature, appeared to cohere under the influence of the incoming waves. This was obviously so, the conductivity being enhanced by the presence of silver, the best of all conductors. He was profoundly impressed by the reliability of Phillips's gear, particularly by the way the showman skipped any unwanted sequence intervening between the required ones. This was strikingly demonstrated when playing simple airs such as "The Bluebells of Scotland."

The writer's early, and primitive, wireless efforts were appropriately rounded off by a trip in the *Walmer Castle*, the first ship on the South African service to have wireless, of the "spark" variety, of course. Here the sparks were fat, long and spectacular, which bestowed quite originally, upon the operator the title of "Sparks."

So thus at the late "M.E." Exhibition we have the "M.E." sponsoring the very latest in electronics applied to control on land and water.

Right from first to last . . . as usual.

The "M.E." Visits Axminster

by [illegible] W. Arthur-Brand

I RECENTLY paid a visit to the fine old town of Axminster, in Devon, to judge the models at the Axminster and District Model, Experimental and Photographic Society's annual exhibition.

It is always a great pleasure for us, of the "M.E." staff, to make new acquaintances in the world of model engineering, and especially so if our new found friends hail from districts obscured either by distance or inaccessibility. It may not easily be possible to place Axminster in either of these categories, but I must venture that distance has, in the past, prevented us being as closely allied as we should have wished. However, now that a firm contact has been made, we hope to see and hear a lot more about this very industrious little group in the future.

From my own point of view—and I know that the "M.E." share my outlook—the exhibition was a huge success and all members of the society and surrounding societies who contributed in their various ways are to be thoroughly congratulated. Among the creditable collection of models in the competition section, there were many which bore the hall-mark of the master craftsman, and many more which showed promise and individuality.

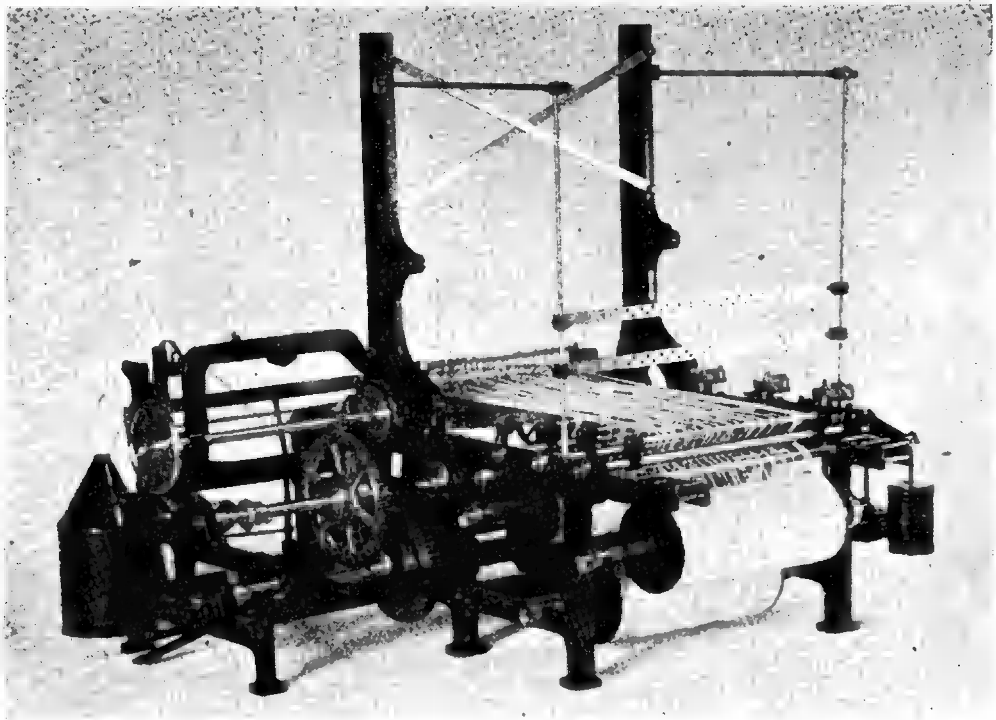
The photographs on these pages of the very fine unfinished model of a carpet loom by Mr. R. C. Porter of Axminster which, incidentally, carried off both the Championship Cup and the cup for the best model in the exhibition, help to illustrate some of the high quality of workmanship displayed. Correct in every detail this model, when completed, will weave miniature carpets in authentic style.

Mr. Porter also carried off the prize in the handicrafts section, with a most tastefully designed and constructed standard lamp, which incorporated a table complete with a pair of ash trays, while Mrs. Porter took the runner-up award with a fine hand-woven fireplace rug.

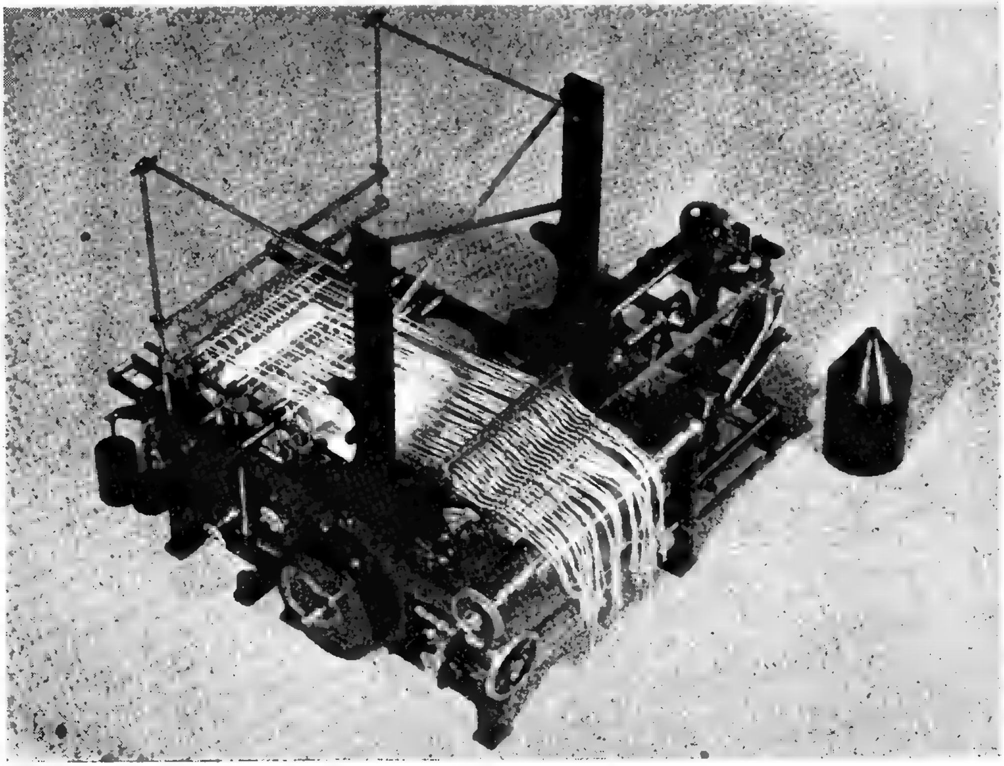
The stationary engine section was well to the fore and the first place was taken by Mr. Harding's neat vertical marine engine. The photographs of Mr. T. Spike's marine unit which carried off the second prize in this section will again show the high standard of workmanship. Mr. Spike also carried off the second and third prizes in the general engineering section (won by Mr. Porter) with his miniature workshop and model shaping machine, which latter received the award of a bronze medal at a past "M.E." Exhibition in London.

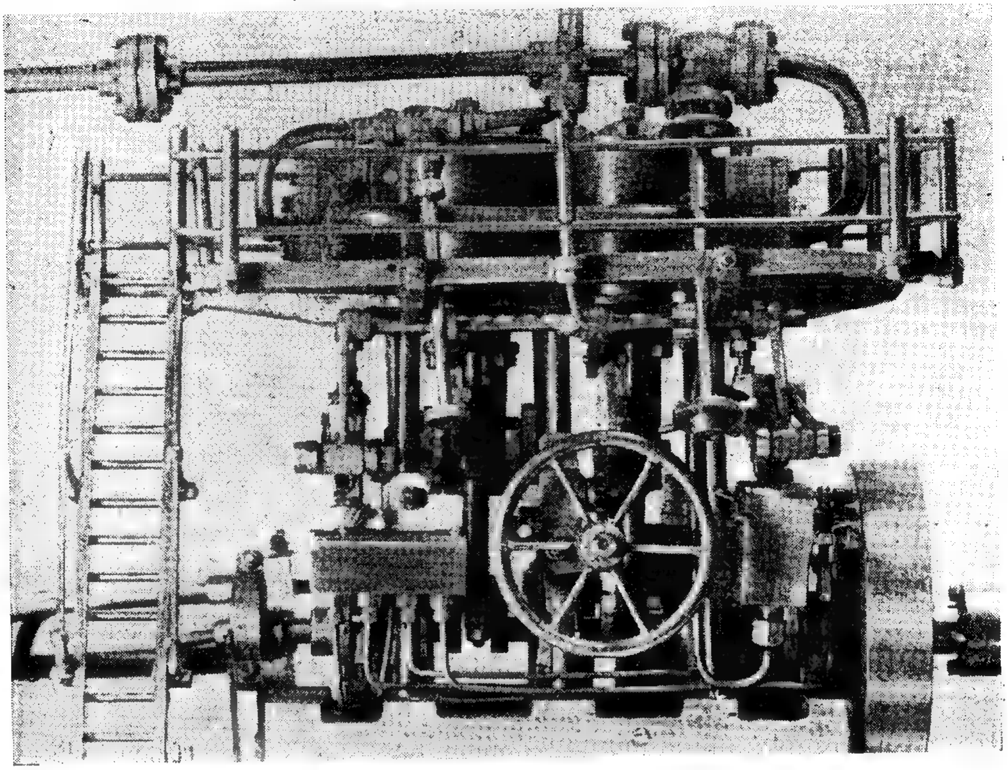
The "heading" photograph, incidentally, shows Mr. Porter's model loom posed on a full-scale Axminster carpet together with the trophies it collected.

Space does not permit a complete list of the winners, but each class was well supported, and those who received awards might well be proud of their efforts. The "firsts" were, without exception, worthy of admiration, and we hope to have the pleasure of seeing these at the next "M.E." Exhibition at the New Royal Horticultural Hall, August 20th-30th, 1952.

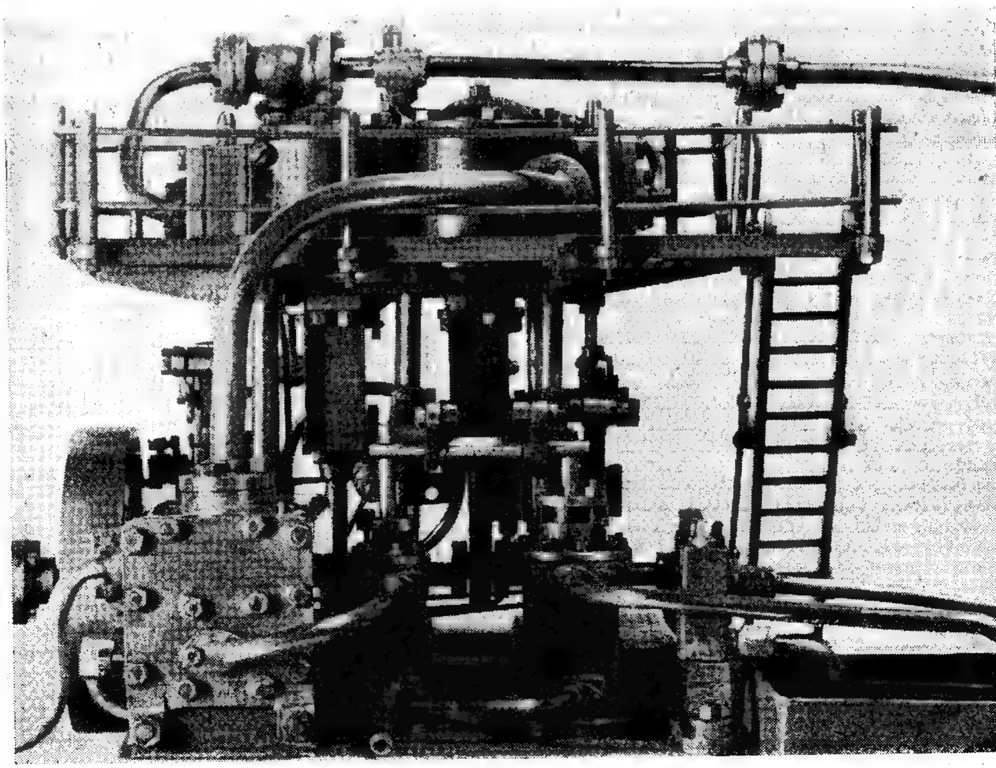


Mr. Porter's model carpet loom is made to ⅛-in. scale, and is a replica of those used by Axminster Carpets Ltd. The top view, from the back, driving side, shows the three warp beams; the lower view, from opposite corner, front, gives the general aspect of the loom. The grippers and colour selection motion are yet to be made





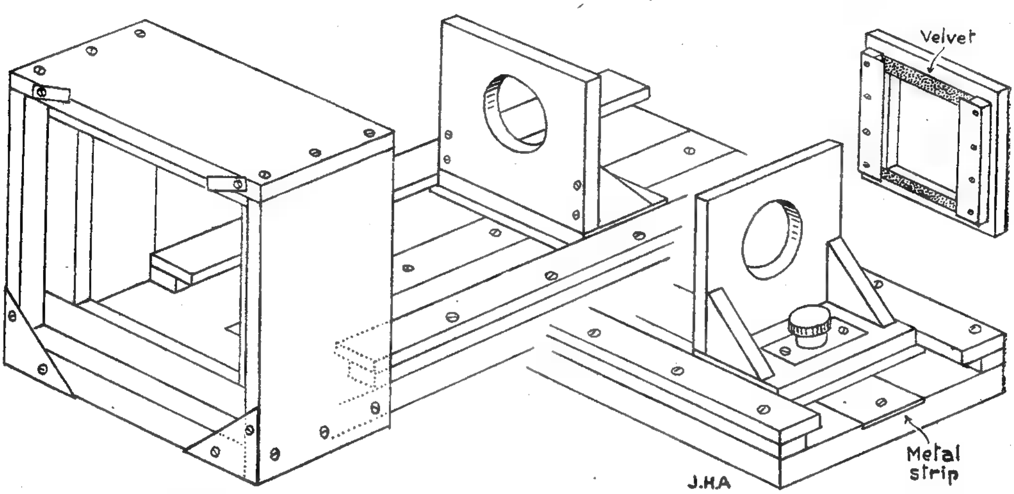
These two photographs show the port and starboard sides of Mr. T. Spike's model marine unit



A BASIC CAMERA

by J. H. Ahern

THE recent correspondence in these columns concerning a suitable camera for model photography makes me think that a number of readers might be interested in a *basic* camera design which would admit of elaboration to suit the ideas of the individual worker, and which could be easily and quickly put together. In which carries the lens panel, slides between them. The back is a simple square box of $\frac{1}{4}$ in. or $\frac{3}{8}$ in. thick material, within which is a frame to which the bellows are glued on the front side and against which the reversible plate back is located. The reversible back is shown in the small drawing in the top right-hand corner of



preparing this drawing, I have assumed that the constructor desires to obtain an instrument which will do the job efficiently with the minimum of "man-hours," and that finish, appearance, and portability, are of very secondary importance. I have not thought it necessary to give dimensions, as these are governed almost automatically by the size and shape of the plate holders, and by the dimensions and focal length of the lens. As a matter of fact, the way to proceed is to obtain one or more plate holders and a focussing screen first, and they can be of any type, wood or metal. Make a back to fit them and then build the camera round the back. I have attempted to illustrate the essentials in the simplest possible form, and I think it will be agreed that the construction is so simple as to partake of the nature of carpentry rather than cabinet making. Everything can be put together with small screws and no fancy wood joints are required. Note that the body is permanently built up on the baseboard and does not fold. It is not even necessary to use a hard wood, provided some good quality and reasonably seasoned deal is available. For the baseboard I suggest $\frac{3}{8}$ in. or $\frac{1}{2}$ in. plywood, and for the reversible back $\frac{1}{4}$ in. or $\frac{3}{8}$ in. plywood.

It will be seen that the baseboard is provided with guides, made of stripwood of two widths, say, $\frac{3}{8}$ in. by $\frac{1}{4}$ in. and $\frac{1}{2}$ in. by $\frac{1}{4}$ in. The front, my diagram. It must be square so that it can be turned round for vertical or horizontal pictures. It has grooves of stripwood and strip metal to fit the plate holders and strips of black velvet glued in recesses cut in the face, above and below the opening. It is held in place by little triangular pieces of sheet metal at the lower corners and by simple turnbuttons at the top corners. And that is really all there is to the back end.

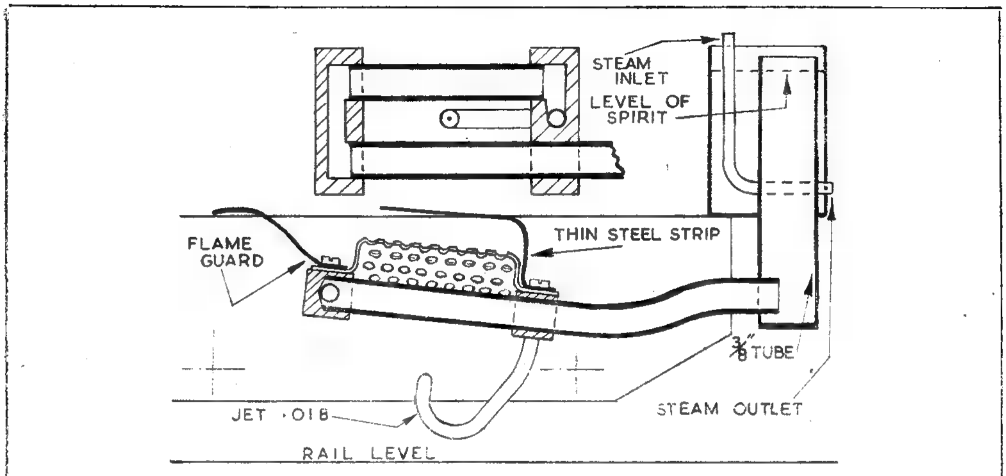
I think the construction of the front will be quite clear from the drawings. The base is built up from two pieces of wood, glued and screwed together, or from one piece with rebates formed to slide in the baseboard guides. A rack and pinion is very nice but by no means essential. I believe there is a rack and pinion in the Meccano range of parts which could be adapted. Also, a lens shutter is quite unnecessary, as exposures are made with a cap. The locking device, for clamping the front in position when correct focus has been found, is very simple. It consists of a screw, with a knurled head, set in a threaded bush which is recessed into the base of the lens panel. Most readers will probably make this bush, but the simplest way to provide one is to obtain an ordinary tripod bush from almost any photographic dealer. These are threaded $\frac{1}{4}$ in.

(*Continued on page* 682)

An "O" Gauge Locomotive

fitted with Vaporising Burner

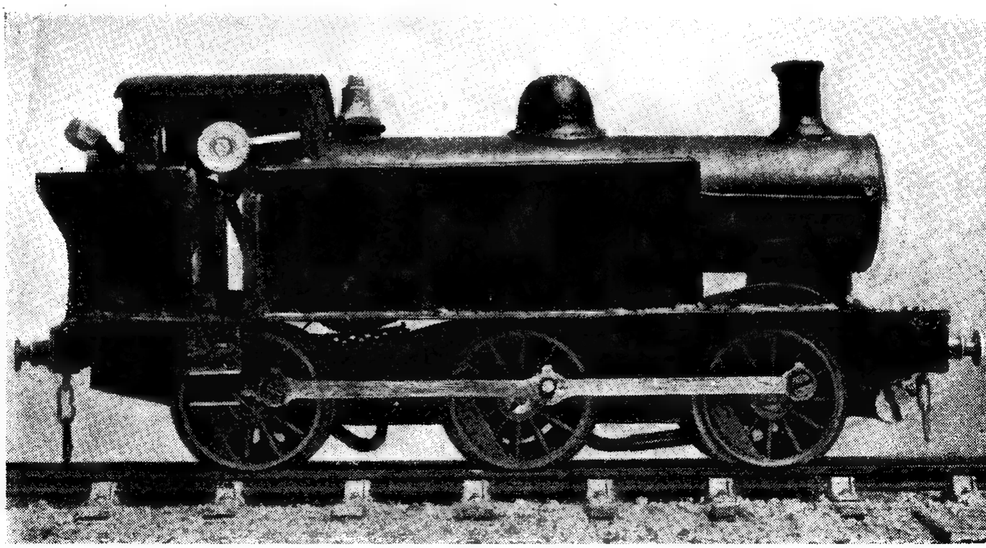
by A. M. Smith



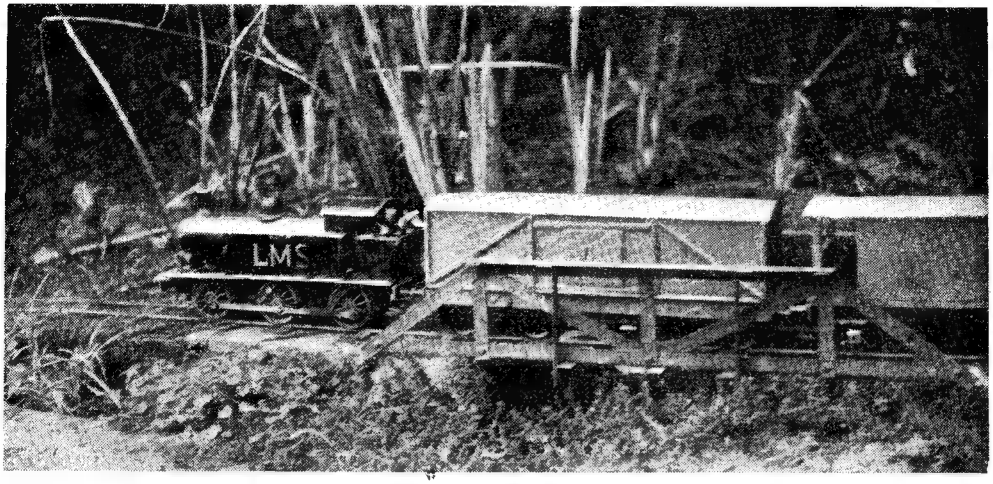
Sketch of vaporising burner fitted to "Mollyette"

THIS short description and drawing of the vaporising burner fitted to my "O"-gauge "Mollyette" might be of interest to readers. It will burn in a strong wind without the flame coming outside the boiler casing and is more realistic than the wick burner originally fitted. This usually enveloped the engine in a mass of flame at regular intervals and left a trail of fire behind it.

The burner works on the same principle as that fitted to my model steamer, *Acantha*, but is controlled by hand. The control-valve on



Mr. A. M. Smith's "O" gauge "Mollyette"



A goods train on the out-door track

be seen in the photograph projecting through the cab side.

The spirit container must be quite airtight when in use, and is 2 in. wide with a $\frac{3}{16}$-in. pipe entering at the top on one side and leaving at the bottom on the opposite side. The steam inlet pipe is pushed into the top of this $\frac{3}{16}$-in. pipe to provide the heat for vaporising.

The vapour passes down the $\frac{3}{8}$-in. tube in the container to the burner. Any liquid fuel which gets carried over is vaporised in the burner tubes before reaching the jet.

The flame burns close to the perforated steel plate, provided the jet is no larger than 0.018 in.

The thin strip of steel above the burner is $\frac{1}{8}$ in. wide and is easily renewed. It is necessary on this burner because the jet is unavoidably too close to the perforated plate, and is also exposed to the wind.

A small wick burner placed under the fuel tank provides heat to start and is taken away as soon as steam is raised.

The burner goes out automatically if the boiler runs dry.

Photographing Models

It might help other readers to have particulars of the light, stop and exposure needed when photographing models by artificial light.

I use Ilford HP3 or Kodak P1200 plates. Exposure is four minutes at f22 and the model is placed on a table about 6 ft. from the normal room light. This light is a 100-watt pearl bulb in a hanging bowl. This gives a diffused light and a sheet of white paper placed on the table between model and camera gives sufficient illumination to the underside of models, such as locomotives.

I increase the exposure by 50 per cent. for all photographs taken 12 in. or less from the subject. This is necessary because the stop values marked on a camera lens are only correct when it is used at the normal distance from the plate.

A BASIC CAMERA

(*Continued from page* 680)

Whitworth, so it is easy enough to provide a screw to fit. In an emergency a screw with a winged head could be used instead of one with a knurled head. A strip of metal, $\frac{1}{2}$ in. or so wide, is recessed flush in the baseboard for the screw to press on when clamped.

I have not shown any provision for a rising front, but I think it is evident that all you want is a separate lens panel, say, $\frac{1}{4}$ in. thick, arranged to slide in guides of stripwood and strip metal similar to those shown for the plate back. A locking-screw should be fitted to one of the guides to clamp the lens panel in position at the required height.

I don't know where you can buy camera bellows, but I should think an enquiry addressed to the Editor of the *British Journal of Photography* might elicit some information on the subject. It is also possible that a careful perusal of some of the photographic journals, or of the *British Journal Almanac* might reveal the names of suitable firms.

*A Universal Dividing Head, PLUS

by A. R. Turpin

THE final accuracy of this dividing head depends entirely on the accuracy with which each part is machined, it is, therefore, advisable to look over the lathe and tools before commencing operations. The lathe centres should be carefully trued up and adjusted to turn truly parallel. Clean all slides, and adjust all gib strips. Remove the feedscrew nut and carefully clean the thread with paraffin and a matchstick. Some accurate drilling will have to be carried out, so sharpen all drills required, and see that the points are accurately ground.

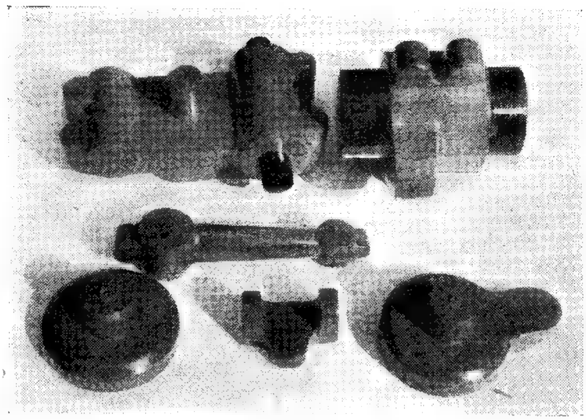
Regarding the patterns, some of which are shown in photograph No. 9, these will only be used once or twice, so there is no need to take the trouble, or go to the expense of buying mahogany or yellow pine, any scraps of well-seasoned hard or soft woods will do, and the necessary smooth finish imparted by the use of coarse and fine glass-paper.

The shrinkage allowance for cast-iron is about 0.1 in. per ft., and in small castings can usually be ignored, making the larger dimension a little on the full side. Draft, which is the taper given to the sides of the pattern so that it may be easily withdrawn from the mould can be often ignored in small castings, but where given should be about 0.1 in .per ft. ; a rub with the glass paper stick will usually be a*ll* that is required, and in the drawings of the patterns it is shown exaggerated by a chain-dotted line.

The patterns should be varnished or painted to make them damp proof, I usually give a coat of cellulose filler, rub well down and then give two coats of brushing cellulose enamel, red for the body of the pattern and black for the bore prints.

There is no necessity to make any core boxes because foundries usually hold stocks of cylindrical core boxes, or use lengths of steel tube for the purpose. If a screwed hook is inserted at some convenient part of the pattern they may be suspended from a wire for painting.

All sharp corners should be given a very slight radius by sanding, which applies to returns also, this may be imparted by using a round nose tool when turning, or by the application of plastic wood for irregular or straight work, the necessary radius being given to the plastic wood by the application of a metal rod of the necessary diameter, which should be wetted to prevent the plastic wood adherring to it. Quite large spaces between joints on curved work can be filled with the same material, which should be allowed to harden for 24 hours before sanding, or filing smooth.



Photograph No. 9. Some of the patterns

The Pillar (1)

A drawing of the pattern for the pillar, and the finished article is shown in Fig. 2. Take a piece of wood about 12 in. long and 3 in. × 3 in. sq. Fit a wood prong centre in the mandrel, and mount your piece of wood between that and the back centre. Turn the whole length down to a diameter of $2\frac{1}{2}$ in. plus a few thous. ; reduce the tailstock end down to a diameter of $1\frac{3}{4}$-in. for a distance of $1\frac{1}{2}$-in., and the far end to the same diameter, so that the full diameter of $2\frac{1}{2}$-in. is left for $7\frac{1}{2}$ in. in between. Glasspaper down to a smooth finish, and part off to length.

If wood turning tools are not available, ordinary metal tools may be used, the mandrel turning at its highest speed.

It will be noticed that the pattern is $\frac{1}{2}$ in. longer than the finished pillar ; this is to allow a trial cut when machining the keyway.

When the casting is received it should be inspected for blow holes, pickled, or well wire brushed before carrying out any turning. If the skin appears at all hard it is as well to rough grind the ends before facing.

The first operation on the pillar is to mount it on the boring table as shown in Fig. 3. The wooden pads are easily cut by taking a piece of $\frac{3}{4}$ in. × $2\frac{1}{2}$ in. hardwood 6 in. long, and clamping it to the boring table with toe clamps. A boring bar is now fixed between centres, the tool adjusted to the outside diameter of the pillar casting, and the groove in the wood fly cut by traversing the cutter along it. When completed, the piece of wood is cut in half to form the two saddles. Clamp the casting between them, carefully aligning the casting with the lathe bed in both the horizontal and vertical planes, using packing if necessary.

Mount a boring bar between centres, and move the cross-slide to bring the casting concentric with it ; fit a side cutter to the bar, and face each end.

*Continued from page 658, " M.E.," November 15, 1951.

Next, fit a boring-bit that will cut in either direction, and adjust it to such a diameter that it will just remove the skin of the inside of the casting, and bore out to a depth of $\frac{1}{2}$ in. at each end. Remove casting from saddle.

Turn up two metal plugs so that they are a drive fit in the ends of the casting, and force them home; the diameter of the plugs should be 4 or 5 thous. larger than the bored diameter of the pillar. Centre drill these plugs before driving them home, and in one of them drill and tap a hole to take a $\frac{1}{4}$ in. B.S.F. screw.

Use this tapped hole to fix a 2 in. length of $\frac{1}{2}$-in. × $\frac{1}{4}$ in. mild-steel bar to the plug to act as a driving dog, and mount the whole assembly between centres as shown in Fig. 4.

Mount a round-nosed roughing tool in the tool-post, set the automatic feed to the finest cut, and the mandrel to the slowest but one backgear speed. Feed in the tool to take a cut deep enough to remove the skin of the casting in one go, set the automatic "cut out." Repeat the process until the diameter is reduced to within 5 or 6 thous. of the required diameter, and then make the final cut with a really sharp finishing tool.

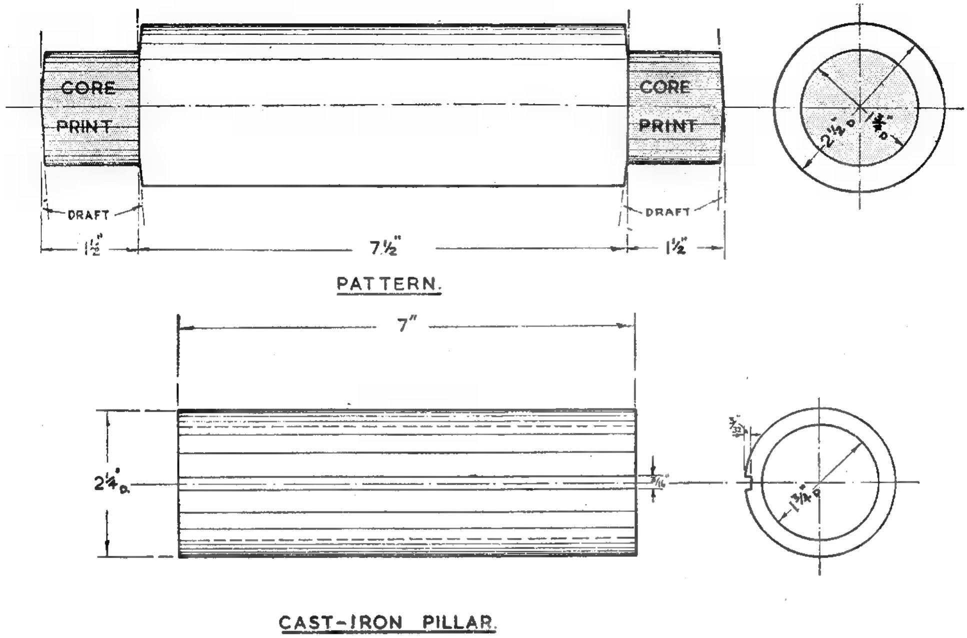


Fig. 2

The next operation is lapping. The lap used may be of brass or piston metal, and consists of a ring casting about 3 in. outside diameter, and $2\frac{1}{4}$-in. inside; it is 2 in. long, and is split longitudinally; cast-on lugs drilled and tapped to take a $\frac{5}{16}$-in. screw allows for adjustment. Place on the pillar which is again mounted between centres, and revolve it at a medium speed. Feed with 80 grit carborundum until the tool marks are removed, and finish with 140 grit; plenty of oil is, of course, used as a lubricant in both cases. (See photograph No. 10.) Care should be taken that the lap does not snatch when first commencing and it is as well to remove the cross-slide. Place a cloth over the lathe bed, and on this place a wood block, by rocking the carriage backwards and forwards the lap will be carried with it, but as soon as it loosens up it should be moved by hand, rotating it around the pillar in both directions as far as it will go; any high spots, or taper, will then be felt, and the lap can be concentrated on these points. The amount tha t will have to be removed will depend on the accuracy of the turning, and the fineness of the turned finish, this

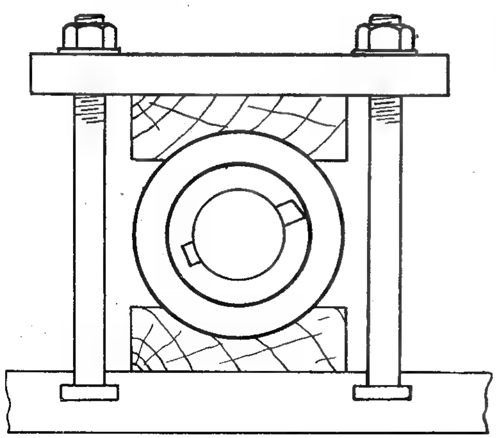
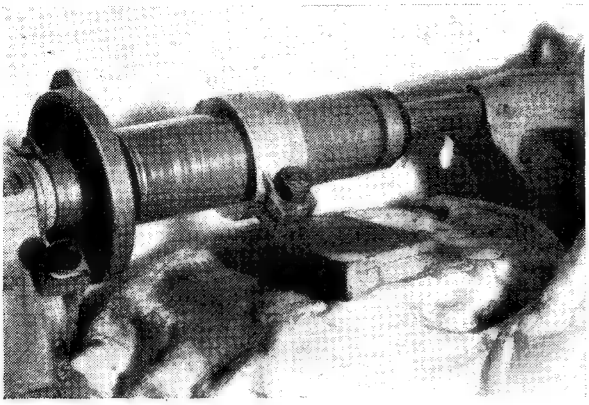


Fig. 3. *Method of clamping pillar to boring table*



Photograph No. 10. Lapping the pillar

can most easily be ascertained when the actual lapping is in progress, and any reduction in diameter below that given in the drawing can be allowed for when fitting the other castings. Having completed the lapping process, the casting should be well scrubbed in a hot concentrated solution of one of the new detergents such as " Tide " or " Whisk," which, by the way, I find an excellent hand cleanser. This method of cleansing I find much more efficient than washing in paraffin, but the work must be dried and oiled immediately afterwards.

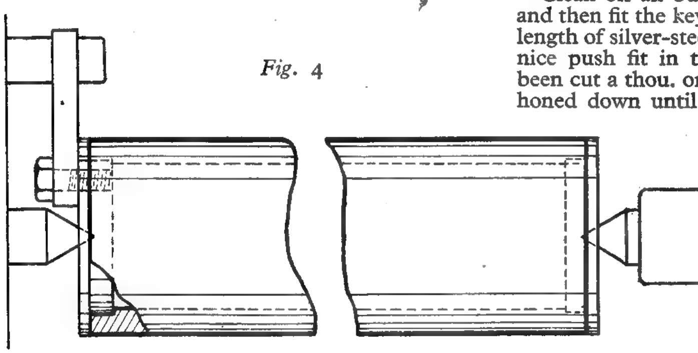


Fig. 4

Remount pillar between centres for cutting the keyway. If you have a shaper or milling spindle this is simple, otherwise to do this accurately the pillar must be clamped securely so that there is no possibility of rotational shake, and the method that I use is as follows : Remove the cap of the nose end mandrel bearing, remove the shims, replace the cap and tighten down ; a packing-piece is placed between the catch plate and the dog on the pillar, and a clamp placed over them, and tightened ; see photograph No. 11.

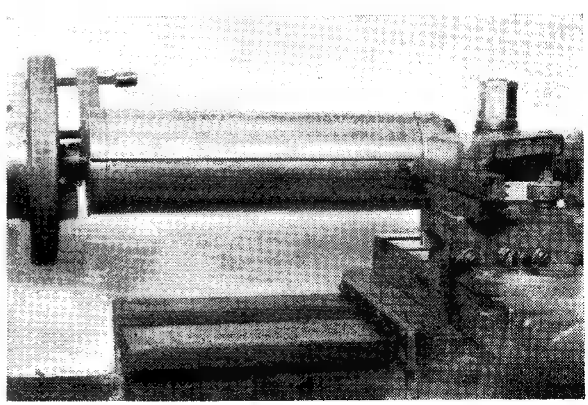
It has been suggested that this method of clamping the mandrel is dentrimental to the lathe, but I have found no ill effects, and any other method is likely to be considerably more complicated.

To cut the keyway, mount a parting tool sideways in the toolpost, packing it up to mid centre height, and feeding it in to the work 4 or 5 thous. at a time, traverse the whole length of the pillar using the rack wheel to do so, and feed in to a final depth of 3/32 in. Now replace the parting tool with a cutter the exact width of the finished keyway ; the key itself is of square section, silver-steel, and a short length of this material, suitably ground and hardened, may be used for the job. Test on the spare $\frac{1}{2}$ in. of pillar to see that the tool is cutting to exactly the right width, as it is imperative that there should be no looseness when fitting the key. The reason that the keyway is cut in two bites, is because it will be found in the long run to be quicker, and to require less effort. The tailstock end of the pillar may now be parted off so that the length measures the required 7 in. and the plug at the other end knocked out. By the way, keep the parted off portion because you will find it handy as a plug gauge when turning other parts that have to fit the pillar.

Clean off all burrs, and dull any sharp edges, and then fit the key, as mentioned before, this is a length of silver-steel, $\frac{3}{16}$ in. sq., and it should be a nice push fit in the keyway ; if the latter has been cut a thou. or so under size, the key may be honed down until it fits snugly. The top plate and carriage will hold the key in position, so there is no need for securing screws.

The Bottom Plate

The pattern for this is shown in Fig. 5. Cut a 3 in. square of $\frac{7}{8}$ in. thick wood ; drill a hole through the centre, say, $\frac{1}{2}$ in. diameter, shoulder a short length of 1 in. dowelling



Photograph No. 11. Cutting the pillar keyway

down to this diameter, and glue it in the drilled hole, this will act [redacted] chucking-piece, [redacted] shown in the drawing. When the glue has set, turn down the square of wood to a disc and chamfer same all round.

Draft has been shown in the drawing but this is hardly necessary for such [redacted] small pattern and is included so that reverse draft should not be put on accidently.

The casting should be machined as shown in Fig. 6. Grip in the three-jaw with the exterior jaws, chamfer towards the chuck, and face the base. In order that the base will grip the boring table firmly, it is necessary that it should be turned very slightly concave, say, 1 thou., most lathes are set to turn concave by about this amount, but test on [redacted] surface plate with engineers blue, and scrap away the centre [redacted] necessary. Not more than the amount mentioned should be removed, otherwise you will pull lumps out of your boring table.

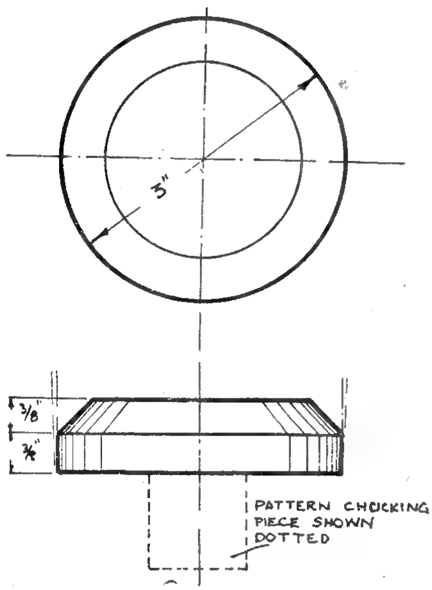


Fig. 5

Next scribe [redacted] line centrally, mark the centre, and also the position of the dowels ; now drill the centre hole, and drill, tap, and counterbore the holes for the dowels, taking great care to drill all three accurately in line. Grip in the four-jaw bottom side inwards, push a short length of rod into the centre hole, and adjust to run truly with the aid of a dial indicator, then bore recess to take pillar to a depth of $\frac{3}{16}$ in.

The Top Plate

The pattern drawing is shown in Fig. 7. Form [redacted] disc in the same way [redacted] discribed for the bottom plate, and then cut [redacted] piece of the same thickness wood about 2 in. × $1\frac{1}{2}$ in., grip this in the machine vice on the vertical slide, or in the toolpost, and with [redacted] fly cutter cut a radius so that

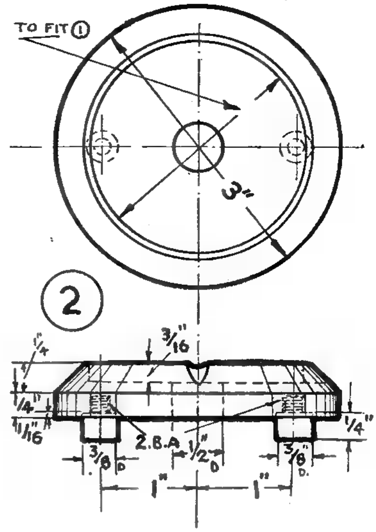


Fig. 6

it will fit snugly on the periphery of the turned disc to form the lug. File or plane the taper, and radius the end, then glue to the edge of the disc.

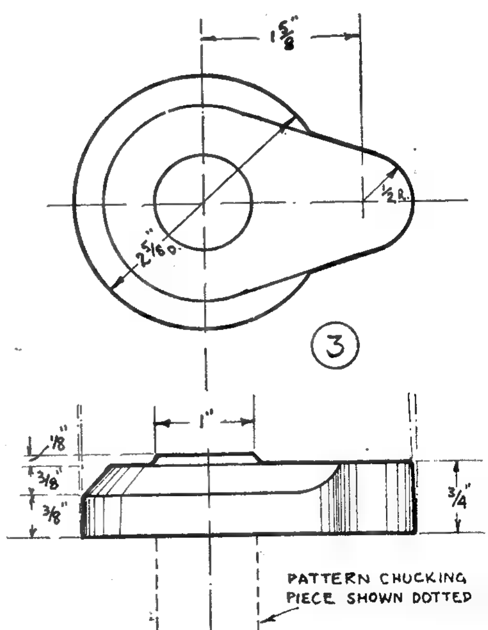


Fig. 7

When the glue has set, fill in the space caused by the chamfer with plastic wood, and with the same material form the necessary fillets.

Rub down and paint.

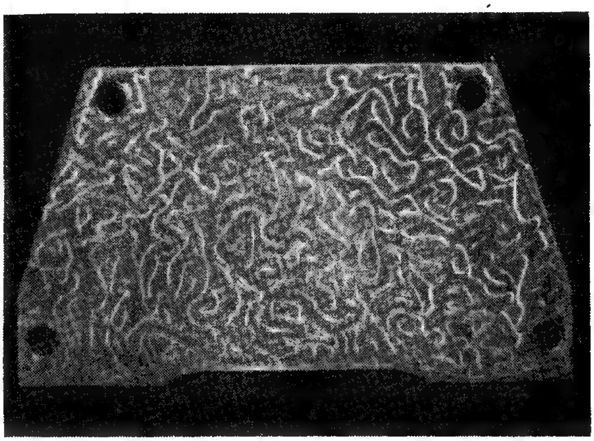
(*To be continued*)

A DECORATIVE FINISH FOR INSTRUMENT WORK

by F. W. Rason

UNTIL fairly recent years the usual finish for instrument work was that of grain and lacquer, but good results demanded considerable care in preparation and was in consequence [redacted] relatively slow operation; especially was this so in the case of irregular-shaped work.

While the effect is most pleasing, its general use belonged to an age of more leisured production; progress demands speedier and more durable methods, but this does not detract in any way from its elegance as [redacted] finish, and where appropriate, is always worth [redacted] consideration when time is not the most important factor.



The graining of turned work is readily carried out in the lathe, and the nature of the operation produces results satisfying in its simplicity and seldom demands variation; on the other hand, where bench work is concerned, the simplicity of straight graining may often be improved upon by introducing variations of pattern. This is usually confined to the larger pieces (for instance, the end-plates of [redacted] piece of mechanism) while the smaller details may retain [redacted] straight grain for contrast.

Readers will be more or less familiar with these effects if only from observation; some conform to standard practices, while others may be of individual fancy. They may be divided into two groups: those which require careful setting up to preserve [redacted] definite symmetry, and [redacted] simpler method calling for less rigid control. Both [redacted] equally attractive, the choice resting upon individual taste. This article confines itself mainly to the latter, [redacted] sample of which is shown in the first photograph.

The required tool in its simplest form is to be seen in Fig. 1, and is conveniently used in the drilling machine. The work upon which it is desired to operate is first brought to a good finish (if polished, so much the better), and then brushed over with [redacted] grinding paste. The tool is run at [redacted] fairly high speed and brought in light contact with the work, which is manipulated diagonally from corner to corner in movements of [redacted] somewhat circular nature, intermixed at random with criss-crossing, and carried out in a non-uniform manner until the whole surface has been treated. Good results [redacted] obtained from this simple tool, and for small work or [redacted] quick job it is quite satisfactory.

An improved tool is shown in detail, incorporating refinements which make it well worth the extra work involved. It was originally made for finishing large plates which required the use of both hands for comfortable manipulation. The provision of spring loading gives [redacted] finer control of pressure, the choice of which is determined by setting of the drilling machine stop. A full compression of $\frac{1}{8}$ in. is allowed for, but in practice half this travel gives ample working pressure, and such should be the setting for the particular operation under consideration.

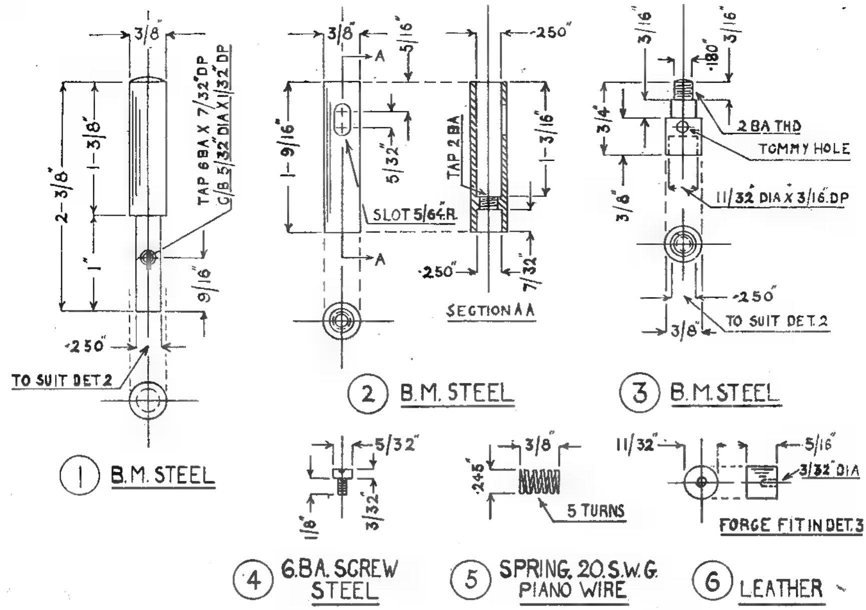
This mean position allows the head to ride up and down according to such variations as may be present in the work; if a suitable weight is attached to the machine lever, thereby keeping the tool under compression on the work, both hands may, with confidence, be used for manipulating the work.

Under ideal conditions, the work would be flat and the set-up parallel, but errors [redacted] not unknown and consequently must be allowed for when the operator is not in direct control of the machine. A simple tool, such as is shown in Fig. 1, may lock or jam against the work when encountering high spots or elevations and is therefore not advisable for this set up. (The rubber buffer, shown in Fig. 1, is incorporated for similar but less exacting reasons).

While this improved model is eminently suited for the method outlined above, it is at the same time equally suitable for manual operation, [redacted] indeed it must be when certain other patternwork is contemplated.

The working head is made detachable, allowing easy interchange of sizes according to requirements. This is largely governed by the type of work involved, but generally speaking the larger the job the bigger the head; the drawing gives [redacted] size of $\frac{3}{8}$ in., while the photograph shows two of even greater size. These [redacted] probably on the large size, and it is recommended that something of the order of $\frac{1}{4}$ in. would satisfy most requirements.

Leather was found to be most suitable for the insertion-piece, det. 6, and shows no appreciable wear after quite long runs. A tendency to build



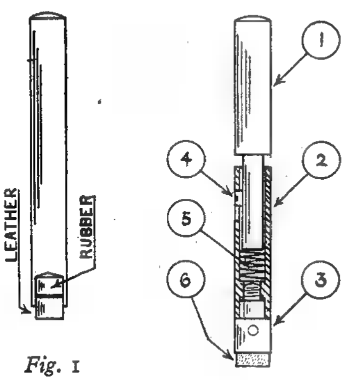
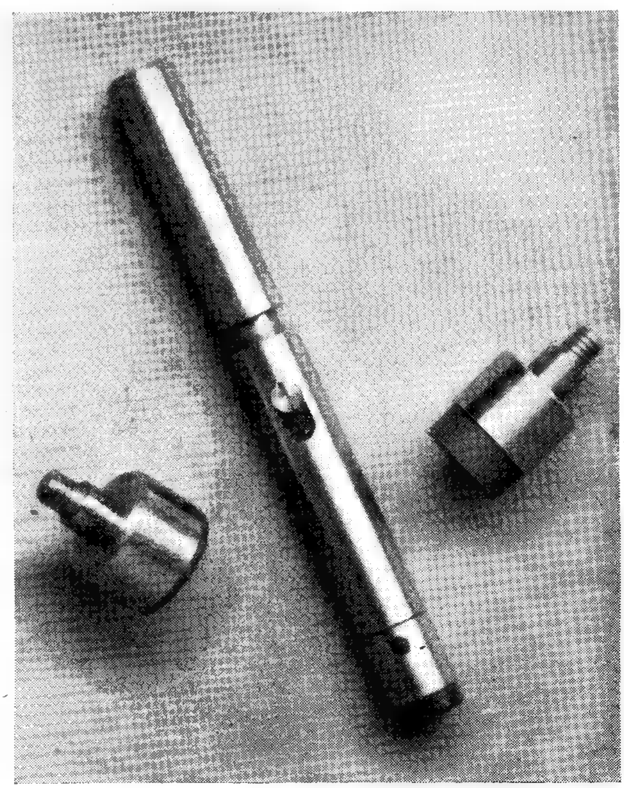


Fig. 1

up in the centre occasionally produced inconsistencies in the pattern work, but was easily overcome by drilling [redacted] small hole in the operating end ; 3/32 in. diameter is quite satisfactory. The projection may with advantage be limited to $\frac{1}{16}$ in., thereby minimising any tendency for the leather to spread.

The construction is fairly straightforward, but should be carried out conscientiously, bearing in mind that the individual parts must run true on assembly. It is advisable to start by making det. 2.

The importance of the 0.250 in. bores [redacted] related to dets. 1 and 3 will be noted, but should they be produced oversize, then dets. 1 and 3 may be made to suit. The fitting of



An improved tool with attachments

dets. 1 and 2 must be free enough to follow the spring, but any slop avoided. The threaded portion of det. 3 is not relied on for centring and should therefore be slightly under sized to prevent jamming. It is important that the spring be open wound; the practice of pulling out to length a close-wound spring is wrong, as it tends to go back after little use.

Leather of the specified thickness may not be to hand, in which case det. 3 may be modified to suit. A few trial plates should be attempted before contemplating important work, as the resulting experience will give a far better appreciation of what is required.

Although a highly polished surface is not essential for reasonable results, it is in the first instance advisable to finish a sample thus, and use it as a standard for judgment of other efforts. It may be as well to point out that this type of finish is normally confined to the non-ferrous metals, although steel, if highly polished, will take it quite well.

The grinding paste as used is a product of the Carborundum Company Ltd., easily obtained and known as Valve Grinding Compound (grease mixed) No. 365 Course. Apply it thinly (or to suit) with a small paint brush over the whole surface; the requisite amount will be ascertained with experience. It may happen that for some reason or the other, satisfaction is not achieved with a particular workpiece, in which case one may be tempted to go over the existing pattern work again. This will not produce good results and it is far better to scrub out and start again. A good finish will be very bold in appearance and give one an impression of depth, in actual fact it is really very shallow and readily erased by a polishing mop. It is for this reason that the work is finally given a coat of lacquer if the full lustre is to be preserved.

It is probably unnecessary to remind readers that the compound must be carefully washed from the work after use; especially is this important if bearing holes are present. And in addition, thoroughly degrease before lacquering.

Only a brief reference has been made to other pattern work, but as the tool itself is common to most forms, the possibilities will no doubt suggest themselves once a working knowledge of requirements is gained by experience on the simple method herewith described.

AN "A" CLASS HYDROPLANE

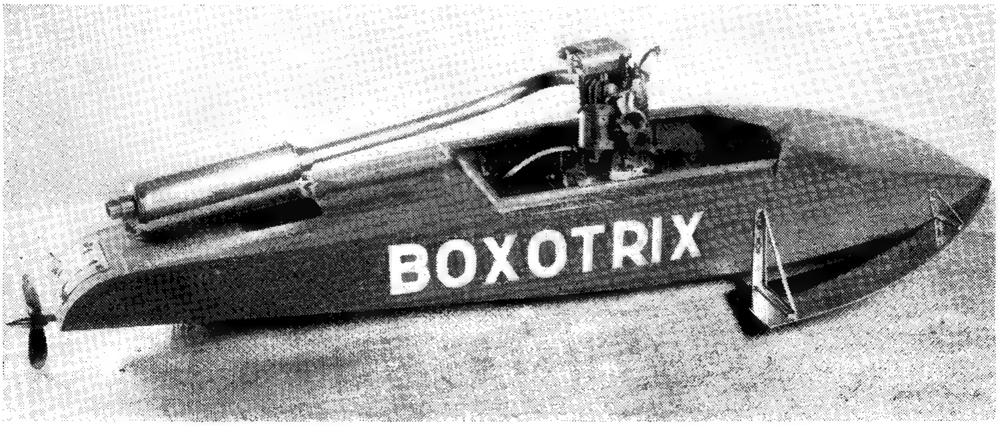
by E. A. Walker

THE accompanying photograph shows my "A" class hydroplane which won the "Wilson" Hydroplane Cup at a recent competition.

It is fitted with a 30 c.c. four-stroke "Kittiwake Major" engine designed by E. T. Westbury and built from a set of castings supplied by Kennions, of Kingsland Road. It has been an interesting job, calling for some ingenuity, as most of the machining was done on a 3-in. pre-war lathe. The hull is of normal construction, fitted with solid balsa sponsons, and the propeller bracket is designed so that the thrust line can be altered without readjusting the articulated drive. The ignition equipment consists of an M.I. coil and three 1½-volt Venner miniature accumulators, although I have run the boat well on two. I find them quite suitable on the sprint runs which are usual at regattas, and the weight saving is considerable, as they weigh only 1 oz. each.

The speeds attained after the usual teething troubles (although these never appear to be over) is 50 m.p.h., an increase of 20 per cent. over my old boat *Gilda* with fully submerged propeller. The photograph shows the hull fitted with experimental adjustable plate sponsons that were first fitted for obtaining the correct angle.

My thanks are due to our club photographer, W. C. Milborrow, for the great care he went to in taking the photograph, which rather flatters it.



Novices' Corner

Cutting Holes in Sheet Material

ALTHOUGH it is easy enough to cut a hole of moderate size in a metal bar by using a twist drill mounted in the drilling machine, some difficulty may be found in forming a large hole neatly in thin sheet metal or in leather or plastics. Moreover, when making washers of jointing material, the two forming cuts should be concentric in order to afford the greatest strength, as well as to give a neat appearance. Sheet celluloid and thin sheets of plastic material can be cut quite easily with a pair of sharp-pointed dividers, and, for cutting large circles, dividers of the kind illustrated in Fig. 1 will

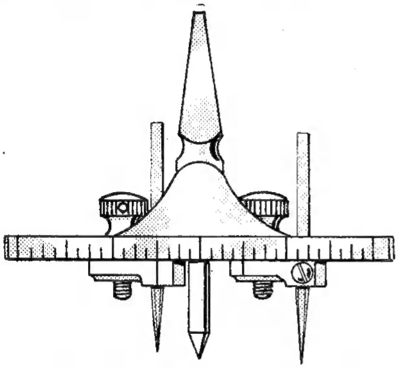


Fig. 2. A form of washer cutter with two adjustable tools

serve well. The material should rest on a piece of hard wood so as to give the pivot leg of the tool a good bearing and also to save damaging the cutting point.

With care, discs and washers can easily be cut out in this way.

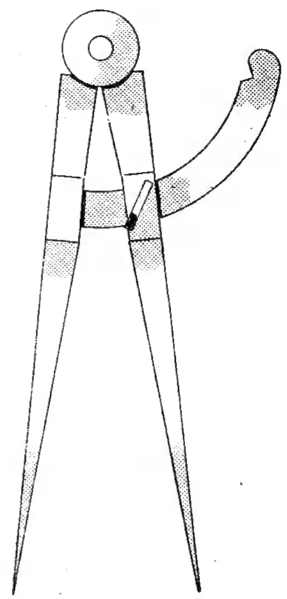


Fig. 1. Dividers are used for cutting thin sheet material

For heavier work, a washer-cutter of the type illustrated in Fig. 2 will be found more convenient. The body of the device has a square tang for mounting in the hand brace, and two adjustable toolholders are carried on the graduated bar ; these toolholders not only slide on the bar, but they can also be reversed to enable circles of widely varying diameter to be cut.

The tools are sharpened to a knife edge and will cut freely in thin material, but when cutting holes in ply-wood, for example, it is advisable first to drill a small guide hole right through the material, and then to take a cut on either side of the work so that the centre portion will come away cleanly.

The familiar tubular wad punch is, perhaps, most often used for cutting out washers in leather and red fibre ; but, after the washer has been cut to size, the central hole has to be formed with

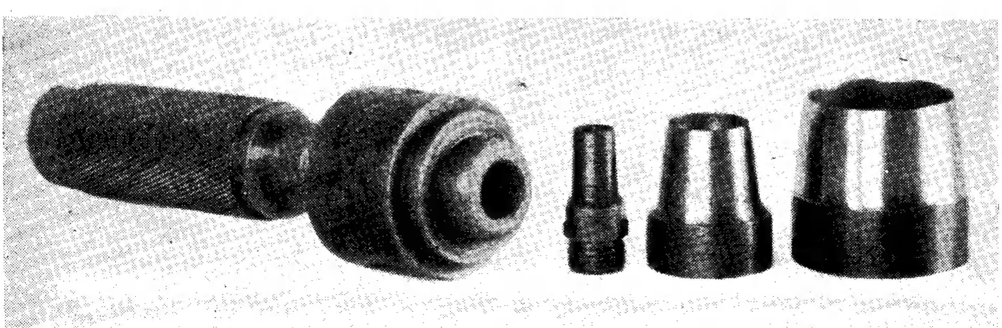


Fig. 3. A punch mounting cutters of three different sizes

second punch, and accurate centring is not easily obtained.

However, concentric cutting is automatically ensured by using the special tool illustrated in Fig. 3. This device, of French manufacture, consists of a handle mounting hardened-steel punches of three different sizes for cutting holes ranging from 3 mm. to 30 mm. in diameter. The smallest punches screw into place, and the two larger sizes fit on to register shoulders formed

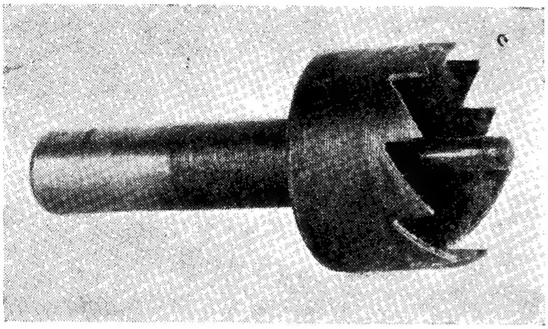


Fig. 4. A crown-saw for cutting plastic material

on the nose of the handle. By using two of the punches at a time, washers of many different sizes can readily be cut in leather, rubber, cardboard, fibre, asbestos and sheet lead.

The work of forming medium-sized holes in plastic material, and also in soft metals will be more quickly and, perhaps, more accurately carried out if a suitable type of cutter is mounted in the drilling machine or in the lathe chuck. For this purpose, a crown-saw like that shown in Fig. 4 is often used. These tools are easily made from mild-steel bar and then case-hardened before use. The teeth can be cut with a file, and accurate spacing is not necessary, for irregularity of pitch will even help to prevent chatter. Commercial saws of this pattern are made for use in the drilling machine or in an electric hand drill, and when made of high-speed steel these tools will machine any material that a hacksaw blade will cut.

Cutting Holes in Sheet Metal

If an ordinary twist drill is employed for drilling holes in thin metal sheet, the result is often an irregular, three-sided hole with a heavy burr formed on the underside. This is owing to the drill point losing its guidance almost at once and, at the same time, the work, unless firmly

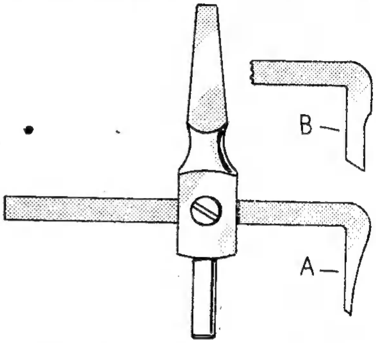


Fig. 6. Hole-cutter. Tool ("A") for wood and tool ("B") for sheet metal

clamped in place, may tend to be moved from side to side by the two cutting lips of the drill. These troubles can usually be avoided by drilling with a centre drill, having a body of the right size, and allowing the shank to go right through the work.

When drilling in this way, the sheet should rest on a piece of hard wood or ebonite and should be either firmly held or clamped in place. For forming larger holes, a fluted countersink will serve well and, again, it can be put right through the work or used on the two surfaces alternately to avoid setting up a burr.

A large hole may have to be cut when fitting unions and bushings to boilers or water tanks; this can be done by using the simple form of cutter illustrated in Fig. 6. A guide hole for the pilot is first drilled and, after the tool has been

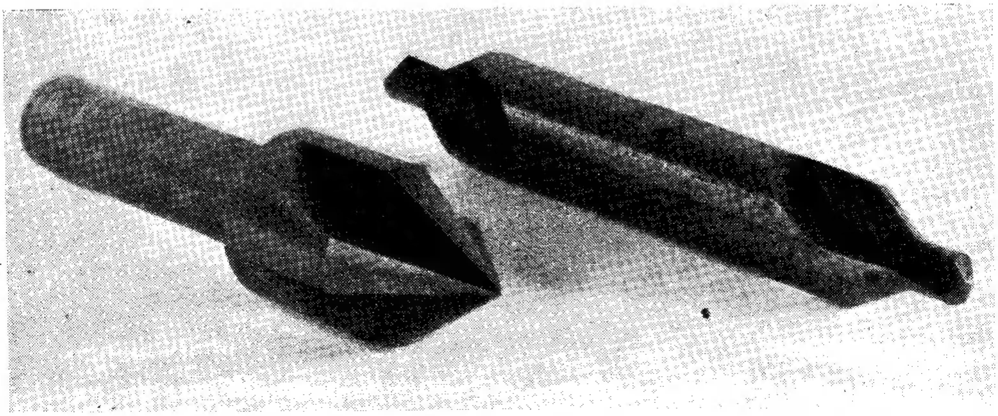


Fig. 5. A countersink and a centre drill used for cutting holes in sheet metal

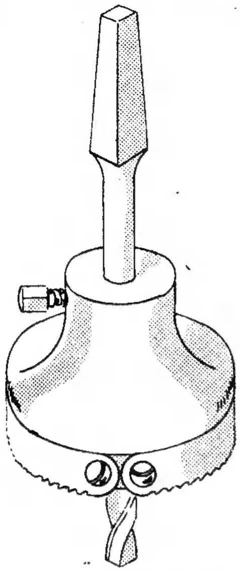


Fig. 7. The Enox circular cutter

set to the required radius, the hand brace is attached to the squared tang to enable the cutter to be steadily rotated until it breaks through the work. The commercial pattern of this tool is supplied with two cutters: the more robust and hardened cutter (*B*) is intended for cutting metal, and the slender cutter (*A*) is for forming large holes in wood.

An ingenious form of crown saw is the Enox, illustrated in Fig. 7. Here, a special, flexible hacksaw blade is secured by means of two screws to a shouldered carrier, and a twist drill with short flutes serves to drill the pilot hole, as well as acting as a guide for the cutter.

These tools, when worked with a hand brace, will cut sheet metal up to $\frac{1}{8}$ in. in thickness. A separate tool is, of course, required for each size of hole, but the tools are available in sizes ranging from $\frac{5}{8}$ in. to $3\frac{1}{2}$ in. nominal diameter.

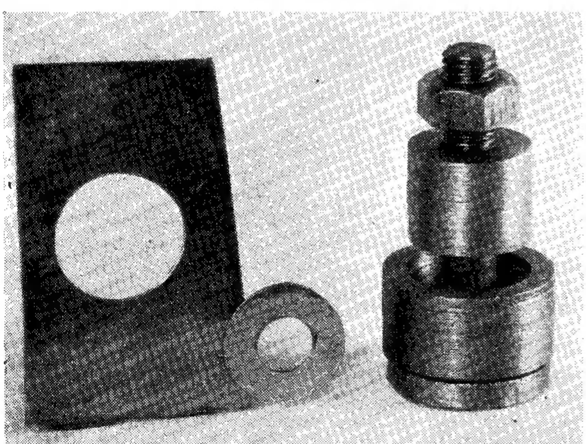


Fig. 8. A special tool made for punching sheet metal

A Novel Form of Sheet Metal Punch

A friend recently called to ask our advice about cutting some holes in a thin sheet-steel tank to take the bushings for the pipe-work connecting the tank to the water-cooled cylinder of an air compressor. However, back in his own well-equipped workshop, he devised and made, from scrap, the ingenious form of cutter illustrated in Figs. 8 and 9.

A $\frac{5}{16}$ in. dia. threaded stud is screwed into the shouldered body (*D*), and the die (*C*) is made a push-fit on the shoulder.

The punch (*B*) was given a 1 thousandth of an inch clearance in the die, and a draw-nut was fitted to the upper end of the stud.

To cut the holes in the tank, a $\frac{5}{16}$ in. dia. pilot hole is first drilled and the stud, with the body and die attached, is passed through the wall of the tank from within. The punch is next slipped on to the projecting end of the stud, and the nut is screwed down until the material is cut through. All the parts were made of mild-steel and, as only two holes of this size had to be cut, the steel was not even case-hardened. A preliminary trial on a piece of scrap material produced the cleanly cut hole shown in the photograph. Although the body of the tool showed no tendency to turn in the work, we have taken the liberty of adding a tommy hole for greater security and possibly to help in withdrawing the cutter after use. In addition, the drawing shows that the body has been made stouter and is furnished with two flats to enable the tool to be readily gripped in the vice for doing bench work. It should be noted that the designer rightly made the die separate from the body, so that the tool could be easily dismantled for clearing the waste material from the interior of the die.

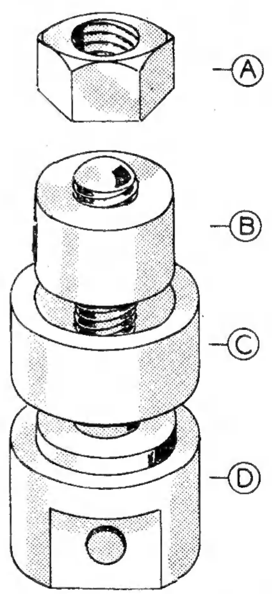


Fig. 9. Details of the special punch. "A"—draw-nut; "B"—circular punch; "C"—the die; "D"—the base-piece

PRACTICAL LETTERS

Midland Railway History

DEAR SIR,—I was interested to read Mr. J. B. S. Poyser's letter in the "Practical Letters" columns of THE MODEL ENGINEER, dated October 4th, 1951, alleging that my letter of August 16th, 1951, was inaccurate.

I would point out that my letter was not concerned in disputing the claim of the Sun Inn to be considered as the birthplace of the Midland Railway, but merely to correct your statement, published in the "Smoke Rings" section, page 34 of THE MODEL ENGINEER, July 12th, that, "On August 16th, 1832 a group of local coal-owners met there (the Sun Inn) to discuss and approve a plan for constructing a railway between Mansfield and Pinxton."

As references mentioned in my letter of 16th August indicate, this line had already been constructed and the real business of the meeting, as recorded on page 8 of F. S. Williams's, "The Midland Railway—Its Rise and Progress," was to adopt a resolution, "That there remains no other plan for their adoption than to attempt to lay a railway from these collieries to the town of Leicester."

As it was the adoption of this resolution at the Sun Inn that gives it its greatest claim to be considered as the birthplace of the Midland Railway, and as my letter was concerned with ensuring that your mis-statement of it was corrected, I do not see how my letter can be taken as disputing the claim of the Sun Inn. If, however, by any chance it had that effect, I hope this further letter will dispel all doubt.

Yours faithfully,

Mansfield. J. A. BIRKS.

Rust Prevention

DEAR SIR,—I was very interested to read Mr. A. M. Scott's letter in the October 11th issue, on the "Prevention of Precipitation of Moisture." About 12 years ago I kept a 40-ft. cabin cruiser in a floating boathouse in Vancouver, free from moisture, with two electric lamps burning continuously; but I used carbon filament lamps which give a greater amount of heat than the metal filament types.

For those who do not have electricity in their workshops, may I make the following suggestion to protect their lathes. Make a close-fitting and air-tight cover for the machine, with as little air space as possible, of plywood with resin glued joints. If it is a bench lathe this should be simple, but a treadle lathe may need the tray enlarging.

Buy a pound or two of silica-gel crystals and get a large tin or baking dish, tip the crystals in and place the tin under the cover. These crystals should be the type that can be re-activated, when dry they are blue. Each time the lathe is used, or even if the cover has only been taken off, pop the tin of crystals in the oven and cook them until they are blue again. They will remove all the moisture from the air, turning pink in the process. It is advisable to solder a piece of metal gauze over the tin, if it can be obtained, to prevent it being accidentally upset.

I think most people will find this an effective way of preventing rust, but the cover must be as tight as possible to prevent more moisture getting in.

Yours faithfully,

Cranford O. T. SCOTT.

DEAR SIR,—I can endorse Mr. Scott's method of de-humidification in so far as I have used it successfully over the past two years in connection with a piano.

I borrowed the idea from an American radio equipment designed for use in the tropics, and placed two 25 W lamps in the bottom of the piano.

As the light was objectionable and the lamps had a short life, I replaced them with two 60 W types connected in series, which produces a warm glow and renders the lamps almost everlasting. The running cost at ⅞d. per unit is about 6d. per week.

Another useful source of warmth is the Robertson heat lamp. A 250 W B.C. type (to fit a lamp-holder) costs about 11s. 6d., and can prevent condensation in a small room. Continuous running cost at the above rate would be 3s. per week. It is best to place the lamp near the floor. As the element is enclosed in a glass bulb, there is, of course, little or no fire risk.

Robertson lamps are available in various patterns (double-ended tubular, etc.), and in other ratings (I add the usual disclaimer).

Yours faithfully,

Epping. N. C. KING.

A Simple Boring Bar

DEAR SIR,—Having read the article on an adjustable boring bar by Mr. Stubbs in the issue dated October 25th, I thought you might be interested in a boring bar I made up.

It consists of a 20 in. length of 1 in. square mild-steel, centre drilled each end so that it can go between the centres of my 3½-in. "Gamage" lathe. Half way along the length this bar is drilled with a cross hole, ¼ in. diameter, to take a tool-bit, and there is a small pinching bolt to hold the bit in position. The "micrometer" adjustment is be means of a tap with a hammer on the back of the tool-bit.

Now, this crude device differs considerably from Mr. Stubbs beautiful little tool, mainly, I think, in the respect that it took 30 minutes to construct, and then it was immediately put to use boring out the cylinder of a 500 c.c. motor-cycle, which it did very accurately.

Yours faithfully,

Petts Wood. G. LINES.